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IN THIS ISSUE

Of interest to all who are connected with industrial arts and vocational education are the following articles which appear in this issue: *Industrial Methods in Junior High Schools*, Fox; *Education in the Industrial Arts*, Schweickhard; *Industrial-Arts Integration*, Parry; *Radio Programs for Industrial Arts*, Lush; *Safety Education*, Hammes; and *Lesson X for Young Workers*, Diamond.

For the instructors of printing are Popowski's *Bible Method of Teaching Printing*, and Miss Lampe's *Silhouette in Linoleum-Block Cutting*.

Teachers of auto mechanics will be interested in *The Truth About the Diesel Engine*, by Schachner.

For the metalworker the following articles have been provided: *The Processes for Enriching Metal Projects*, Manzer; *Sheet-Metal Flower Urn*, Kroll; *Modernistic Candlestick*, Baxter; *Keyway Cutter*, Moe and Bugg; and *Chipping and Filing*, Lindstrom.

Drawing teachers may find helpful suggestions in the articles on *Templates for Producing Decorative Designs*, Bone; *Are You Sure of Your Scale?*, Flam; *A Black-Line Printer*, Murphy; and *Keyway Cutter*, Moe and Bugg.

For the woodworking instructor have been provided *Breakfast Chair*, Chadek; *Treasure Chest for the Household Silver*, King; *Picture Marquetry*, Carey; and *Watch Holder*, Towle.

Instructors of electricity may find *Low-Voltage Distribution System*, Webb; and *Making a Simple Compass*, Sutor, helpful.

Camp directors will be interested in the *Cheyenne Roach*, Hunt; and *Kinks for the Outdoor Craftsman*, Hunter.

CONVENTIONS TO BE HELD

April 21–22 Nebraska Industrial-Arts Teachers Association, Omaha, Nebr.

April 27–29 Michigan Industrial Education Association, Grand Rapids, Mich.

May 3–6 Western Arts Association, Grand Rapids, Mich.

May 5–6 Wisconsin Vocational Association for Adult Education, Oshkosh, Wis.

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J-50 SINGLE SHAPER

Students advance faster . . . instructors have a better opportunity to teach on Yates-American machines because they are designed with a complete understanding of educational needs and requirements.

The J-50 Shaper described here is a splendid example of such design. It is rugged, sturdy, long-lived . . . built to withstand years of hard, constant usage. The strong spindle unit is mounted on gibbed ways . . . the spindle itself is made of heat treated alloy steel, runs in precision type ball bearings, and is lubricated by a mist of filtered oil.

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Easy to adjust and operate, this machine greatly simplifies the production of moulding and other irregular contours in advanced cabinet making classes. It will take a considerable load without chattering, or slowing down and will produce a high finish even under adverse conditions. Investigate the J-50 on the basis of safety, sturdiness and dependability. Write for information now!

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

This is the seventh of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. We will welcome your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

SHORT TALKS ON WOOD

RED CEDAR (*Juniperus virginiana*)

The wide popularity of "cedar chests" has won special recognition for this wood in the modern home. It is light, soft, fine-grained, durable and pleasantly aromatic. Works easily. Sapwood is white, heartwood is dull red.

Red cedar is extremely durable in contact with soil and for this reason is preferred for posts and poles. Is almost the only wood used in lead pencils. Its pronounced fragrance is supposed to ward off moths and other insects which accounts for its extensive use in clothes chests, closets and interior woodwork.

Is found from Nova Scotia to South Dakota, south to Florida and Texas. Grows in all kinds of soils—from swamps to rocky ridges. Slow growing.

Variable in habit. Young trees have slender, horizontal branches and a narrow, compact conical head, which in old trees becomes broad and rounded. Trunk is continuous and attains a height of 25 to 30 feet, and a diameter of 8 to 15 inches. Makes an excellent low windbreak. Endures close pruning.

The bark on the trunk is light brown, tinged with red, and separating into long, narrow shreds on old trees. Has two kinds of leaves, both kinds usually found on the same tree. Commoner kind is 1/16″ long, dark green, scale-like, overlapping, pressed to the twig to give it an angular appearance, persist for many years. The other kind is 1/2″ long, awl-shaped, sharp pointed.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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Industrial-Arts Methods in Junior High Schools

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Methodology in industrial arts has been understressed. To most teachers of industrial arts, method has been a piece-by-piece demonstration and construction. Adequate method must involve the predication and the acceptance of the objectives of the junior high school.

Objectives of the Junior High School

The objectives of the junior high school have been promulgated by various authorities. In the main, they cover the following points: Recognition of adolescence, recognition of individual differences, exploration, guidance, development of worthy home membership, development of wholesome use of leisure time, and stimulation of worth-while civic character.

These objectives determine the objectives of all junior-high-school subjects, including industrial arts. They likewise determine the objectives and procedures of all phases of an industrial-arts education, including shop management and methodology. Finally, they are translated into specific outcomes — what a student should know or possess as a result of pursuing a course in industrial arts.

The outcomes may be given as follows:

1. How to interpret, analyze, and solve a problem relating to shopwork.
2. How to construct a project in shopwork in terms of printed directions or instructions.
3. Names of tools, machines, and equipment in a shop, and their identification.
4. How to care for and use tools, machines, and equipment safely.
5. Names of processes and how they are performed.
6. Names of materials used in the shop and their identification.
7. Names and identification of typical products of the shop and of the industry.
8. How to evaluate products as to use, workmanship, beauty, and cost.
9. Significant facts of the trade — a picture of the high spots of the industry — and additional information as to hazards, qualifications, and opportunities, valuable for guidance.
10. Acquisition of desirable attitudes relative to respect for labor and for the worker, to a realization of the value of industrial arts for home application and for expenditure of leisure time and to the realization of the value of industrial arts in developing traits such as pride in achievement, industry, alertness, perseverance, respect for the contribution of others, and sincerity.

Methods in the Light of Objectives

The outcomes mentioned in the foregoing suggest varied teaching procedures with reference to the various classes of activities considered in an industrial-arts education at the junior-high-school level. The various activities referred to are basic projects, individual projects, leisure-time projects, group projects, co-operative projects, and shop talks.

Basic projects. By basic projects are meant such projects considered and undertaken at the beginning of a shop course in order to give some measure of skill with the fundamental tools and processes, so that the student may readily proceed to other classes of activities for the values inherent in them.

1. With respect to basic projects, a selection is recommended with regard for the experiences, use, or need of the student. Thus, interest may be stimulated, or if it is already present, it will be considerably enhanced.
2. A discussion of a model in terms of its beauty, workmanship, and use, gives recognition to the consumer attitude.
3. Likewise a consideration of the kinds and quantities of material involved, emphasizes another phase of the consumer attitude — the cost.
4. A relationship between a working sketch and the model on the one hand, and between the sketch and the steps in construction on the other hand, serves to make progress more orderly.
5. Preceding the consideration of the steps in construction, demonstration of the use of tools and other necessary equipment, and of the processes, is the function of the teacher. Later demonstration by students for further classification should follow. Attitudes of respect for opinions and efforts of others, of respect for labor and toward safety are marked for stress.
6. During the steps of construction by the students, there should be frequent checking for needed redemonstration; for stress upon attitudes of care, of neatness and of economy, for sympathetic and constructive criticism, and for praise for satisfactory achievement.
7. Throughout the construction, related information concerned with brief but appropriate topics in history, geography, science, arithmetic, and English, are given informally and incidentally to give background to the industrial-arts education.

This lesson, in the main, follows the formula for the development of skill or habit. It should be noted, however, that at the junior-high-school level, no formal drill is advised. Whatever skill is acquired, is derived from normal repetition of the processes with varied projects, and the rate at which this skill is normally acquired furnishes a basis for sound guidance.

It will be observed also that great emphasis is placed upon the acquisition of desirable attitudes and citizenship traits. These, if properly acquired, will persist and will contribute to future worthwhile civic and social character whatever the future calling or line of education selected by the student.

Individual project. Individual projects are recommended for consideration, following the completion of the basic projects. Through individual projects, the interest of the individual student is satisfied, the difficulty of construction is suited to his ability and the time allowed for completion fixed according to his rate of activity.

With the individual project there is a

Objectives, outcomes, and methods as applied to industrial-arts work in the 7th, 8th, and 9th grades.

shift from the development of habit or skill lesson to the development of a technique with reference to the solution of a problem in construction. The following steps are appropriate:

1. The student selects the project he will construct after a consideration of models or needs.

2. After discussion and study, he decides upon the size, the design, the color, and other significant features or modifications of the model examined.

3. There is a determination of the kind and amount of material needed, a further stress of the consumer attitude.

4. A working sketch or plan by the student with suggestions from the teacher, enables the student to proceed with the construction with considerably less dependence upon the teacher than in the construction of basic projects. The working sketch gives further clarity to the project.

5. A discussion between the student and teacher results in a decision as to the steps to be followed, equipment to be used, and cautions to be observed. Any equipment not involved in the construction of basic projects, any processes not covered previous to the consideration of individual projects, will require demonstration by the teacher and then by the students.

6. As the work progresses, checking by the student and teacher will be necessary. Reinterpretation of the problem may be indicated. Additional information may be required and constructive suggestions may be offered. Successful effort merits recognition and the resulting encouragement.

7. In the course of the discussion and of the progress of work much related information in science, geography, arithmetic, history, and English again may be incidentally but briefly introduced by the teacher or supplied by the student.

8. The distinct advance implied in the construction of individual projects lies in the cultivation of such attitudes and habits as initiative and dispassionate judgment, confidence in ability to achieve with growing independence of the teacher. The technique of attack, resulting from job analysis, with reference to a problem in construction is the factor in the development of confidence and pride in achievement.

An additional procedure with respect to the construction of individual projects is then suggested to establish further independence of the teacher. Initiative and dependability in the student are considerably strengthened. The procedure referred to may be looked upon as a work-sheet method, wherein the construction results from the reading and following of step-by-step printed directions.

A teaching procedure based upon printed directions for the student should involve these considerations:

1. An idea — somewhat indefinite — of the individual project to be constructed. Discussion with the teacher to make the idea more definite and to secure opinions as to possible modifications. A picture of the project and a list of the parts form the basis of the discussion.

2. Printed directions for the construction of each part involved in the project. Attention is given to the directions, to the working sketch of the part, to the equipment necessary for the construction of the part, to the steps to be followed in constructing the part and to the securing of the instructor's approval.

3. Printed directions for the assembly of the parts. Advice is given again in terms of a working sketch, in terms of tools and equipment, and in terms of steps.

4. Finishing of the project. Reference is made to types of finishing from which a selection may be made, to materials and equipment needed, and to steps to be followed.

5. If in this construction, tools and equipment, and the like, are introduced for the first time, demonstration by the teacher is essential.

6. Throughout the construction, related information may be introduced by the teacher and sought by the student to give a broader background to the work and to aid in the integration of the experience of the student.

Leisure-time projects. It may be of significance to add at this point that individual projects may be used that appeal to the use of leisure time for partial construction and thus contribute to the stimulation of an attitude with respect to the use of industrial arts in the expenditure of leisure time. Individual projects used for this specific purpose may be partially constructed at school and completed at home, or, vice versa, partially constructed at home and completed at school. The point may be reached where the entire construction is completed at home with adequate credit given in school for the construction.

Group and co-operative projects: The consideration of group and co-operative projects is necessary in a balanced industrial-arts education. By a group project is meant one that requires contributions from a number of students in a particular shop. With the assembly of these contributions, the group project takes form. A co-operative project may be defined as one requiring contributions from students of various shops and departments. The contributions are suited to the individual ability of the various students concerned, and the method applicable is essentially referred to in the discussion of individual projects.

Obviously, there are untold possibilities for the development of co-operation, leadership, respect for the opinions and contributions of others, altruism, and related habits and attitudes. There also are opportunities for the integration of the experiences of the students.

Shop talks. A most significant activity in industrial-arts education is the *shop talk* so called for want of a more meaningful characterization. The shop talks, in aggregate for a particular shop, have for their purpose the gathering and interpretation of information relative to particular trades, information that will give a picture of the high spots in these trades. They also provide the individual student with additional culture and a sounder and broader basis for guidance into particular trade activities.

These talks should be given always in terms of a significant problem. They should make provision for sources of information so that students may contribute to the socialized discussion and thus indicate by the amount and quality of the contribution an interest also valuable for guidance purposes. Necessarily there are details to be offered by the teacher in a lesson of this kind and concreteness with respect to mere information, afforded through the various means of visual instruction — collections, pictures, charts, slides, films, and the like. That the matter of these talks may be retained for later use in connection with exploration and guidance, the facts should be briefly and significantly summarized. A final stage in a presentation of this type is the enumeration of additional problems that come to the minds of the students and are reserved for later study by them.

As was intimated in the foregoing, a lesson of this type should be cast into a socialized form, with the necessary activity of the teacher at a very minimum.

Conclusion

In summary it may be stated that the methods briefly outlined in the foregoing are suggested by these larger goals:

A knowledge of basic facts and skills of fundamental trades that will serve as a basis for adequate guidance with respect to further pursuit of the trades.

The provision of industrial experiences that give definite patterns of living and that show the instrumentalities by which society has reared and maintained itself.

The provision of a technique of attack upon or study of problems in trades and in industry, with an emphasis upon calm judgment and analysis and upon altruism in activity.

The stimulation of attitudes and citizenship traits which should remain the permanent possession of the student irrespective of his future direction, and which should contribute toward the establishment of the individual as a worthy social and civic character of integrated personality.

At the present time the furniture designer may choose to work in one of many ways. Undoubtedly, if he is developing fine furniture, he will find it very necessary to adhere closely to the important traditions of his profession. He will go back many centuries in his research and will look upon the principal furniture periods for his inspiration. This designer will be ever aware that he is molding subtle clay and that with every touch he must be rigidly on guard to maintain the proper degree of cultured restraint. — *Shea and Wenger.*

The Truth About the Diesel Engine

Max H. Schachner

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General Motors Sales Corporation,
Diesel Engine Division,
Cleveland, Ohio

A paper read December 3, 1938, before the Automotive Section Meeting, at the American Vocational Association Convention, St. Louis, Missouri.

A cold analysis of our respective lives and activities would make very uninteresting reading to the average person. This is probably because of the utter simplicity of our work. Possibly it is human nature to shroud ourselves with either glamor, adventure, or mystery.

The Diesel-engine business actually possesses little that appeals to the imagination. However, in this fast-moving age of ours, it is hard to find out facts about each other's line of work, and as a result we are forced to accept a picture on its face value.

We, as Diesel-engine manufacturers, in attempting to dissolve this cloak of mystery that seemingly surrounds our business, will have to give you a glimpse behind the scenes of other comparable lines of business. For a moment, let us consider engines in general, and include steam and gasoline engines, together with the Diesel.

Heat Engines

Digging into the science of thermodynamics, we learn that these three are heat engines. That is, they convert heat into work. Heat units are converted into units of energy. A hot gas under pressure expands generating power in exchange for B.T.U.'s.

The steam engine which is familiar to all of you is perhaps the most complicated form of prime mover. It requires, first of all, a generator to produce a gas in the form of steam of the requisite pressure and temperature in exchange for the heat units given off by the destructive oxidation of fuel, and secondly a heat engine for conversion of heat into power. Strip aside this descriptive curtain, — in other words, let's call it a coal-fired boiler for producing steam and a steam engine. You, who were raised on the farm, will remember the glamor and charm of the old threshing-machine engines, that is, if you were mechanically minded. After you were a little older, the shroud lifted and the engineman's job on the threshing crew lost its appeal. We could keep the second part of the picture simple by referring to the garden variety of steam engine used in sawmills and threshing machines. These were good old reliable engines, flexible and adaptable to their day when cheap fuel offset economy.

But to keep up with the march of time, we have to consider more efficient types of steam prime movers. Extra gadgets enter the picture, feed water heaters for greater economy, and superheaters to make a hotter and drier gas out of the steam. Also, turbines and steam condensers are among the more modern improvements.

The steam condenser plays an important part in cooling and condensing the exhaust steam. The condensing action creates a vacuum, thus permitting a greater expansion of steam and, therefore, additional useful work in the engine before it is exhausted. This established another fundamental — that an increased expansion ratio in an engine means greater efficiency.

Design Evolution

In order to simplify the engine, suppose we convert our fuel directly into usable heat units, inside of the engine. In other words, let's build our fire in the cylinder. This is not at all ridiculous; the first Diesels as you know, were designed to burn coal dust. This system has the immediate advantage of increased efficiency by doing away with the boiler apparatus and its attendant heat losses through exchange and radiation. Of course, we won't have the advantage of exhausting to a vacuum, but we can improve the expansion ratio by the principle we employ to ignite our fuel.

The Otto-cycle spark-ignition engine which in our language is the garden variety of gasoline engine, has certain limitations when it comes to expansion ratio. The vaporized fuel, mixed with a charge of air, cannot be compressed to much less than one fifth of its initial volume without generating internal heat, sufficient to cause a premature explosion. There are, of course, means to increase this compression ratio through the use of special fuels and ingenious combustion-chamber designs. Special combustion chambers tend to keep the compressed charge below a critical temperature by rapid heat dissipation. Here again a limit is soon reached which would still permit load and speed flexibility. Special purpose, higher-output gasoline engines with still higher compression and expansion ratios are manufactured, but these have a narrow range of usefulness and are confined to nearly constant speed and load applications.

The Diesel engine, or to more accurately define it, the compression-ignition engine, is efficient because it can utilize a high expansion ratio. Commercial ratios range in the neighborhood of 15 to 1. Bear in mind that this ratio is the index of efficiency, all other things being equal. By this I mean, assuming a well-engineered engine and entirely discounting any fuel-cost differential, the greater the expansion ratio, the higher the efficiency or power output that can be obtained from the fuel. Our Mr. Kettering aptly states it this way: "You can't build a very high one-story building."

The compression-ignition principle of the Diesel engine goes hand in hand with the high ratio of compression and expansion. The phenomenon of high temperature rise, due to molecular friction when air is suddenly compressed, is a convenient means of igniting an injected change of fuel. At any rate, it does away with the spark-ignition system and certainly simplifies the engine.

The Diesel-injection system displaces the gasoline carburetor and manifold as the heart of the engine. The fuel is metered and timed, and injected in accordance with the load and speed requirements. Modern designing has simplified this function to a single control.

Design Simplicity

In many other respects the Diesel engine is simpler than the gasoline engine. Physically the Diesel engine is quite similar, particularly with respect to cylinders, pistons, connecting rods, crankshaft, camshaft, valves, gears, and the like. It is necessarily of heavier construction to withstand the higher compression ratios. An injection pump and valve take the place of the carburetor and electric timing system. These injector units, by the way, are very simple to understand; they consist simply of a plunger pump, valve, and spray nozzle. In comparison, do you fully understand all that takes place in a gasoline carburetor? In place of the spark ignition, we have ignition from the heat of compression. You may possibly consider the source of this heat as a mystery, but then, what about the phenomenon of an electric current jumping across the gap of a spark plug? From a mystery standpoint, I'll trade you even, and there you are, a simpler engine all around.

Two-Cycle Design

You may ask, what about the General Motors two-cycle Diesel engine, and question the simplicity of its design.

First, let us give you some of the logic of our thinking, with respect to our design.

Gasoline and Diesel engines are approximately equal horsepower output for the same cubic-inch piston displacement. The efficiency of the Diesel is accountable in the smaller amount of fuel required for the same load. As already mentioned, the

Diesel of necessity is of much heavier construction to withstand the higher compression ratio. That means that crankshafts, bearings, connecting rods, cylinder blocks, and crankcase are all larger in size and likewise much heavier in weight. In creating a new design, our aim was to reduce this size and weight to a comparable basis with the gasoline engine. It wasn't practical to attempt to derive greater efficiency from already established practical limits, in the way of expansion ratios and mean effective pressures, and higher speed. Our problem, therefore, resolved itself into making the piston work oftener. As it wasn't practical to increase the speed of the engine, we decided to eliminate the two pumping strokes of the four-stroke-cycle pistons, the exhaust and the intake, and to arrange for every downward stroke of the piston to be a working stroke. So all we did was to replace the two reciprocating pumping strokes with a rotary pump or blower mounted on the side of the engine. By thus deriving twice the power from a given displacement, we are able to go to a much smaller cylinder size and build all the strength we needed into the engine, and still keep within our size and weight requirements.

We even contributed further to the simplification of the Diesel by combining the fuel-injection pump with the injection valve, thus eliminating high-pressure fuel lines.

Early Diesels were adaptations, more or less, of steam engines. Later designs followed gasoline-engine practice. Our contribution was to create a still smaller and lighter-weight Diesel engine to meet modern power requirements with conservatively rated high horsepower output. This final evolution then produced a Diesel engine designed for the most advantageous use of the Diesel principle.

Efficiency

With respect to thermal efficiency, even the smallest Diesel can match large superpower steam plants with respect to the number of B.T.U.'s required per unit of work. Even with the double handicap of the price differential between coal and fuel oil and the purchasing of fuel in small quantity, the small Diesel can produce power at a rate nearly equal with the average large steam plant.

Further improvement in the Diesel efficiency is now being carried out along the lines of waste heat recovery. This development is yet to be fully exploited. Steam efficiency along these lines has already approached its theoretical maximum.

Economy

Compared to gasoline engines, Diesels produce the same amount of power with about 60 per cent as much fuel under continuous load conditions. With variable loads and speeds the Diesel requires only about 50 per cent as much fuel. This economy in consumption is of major importance. Additional economy is realized in the cost of fuel. The difference in cost favors Diesel fuel at from one third to two thirds the cost of gasoline. This differential will vary in accordance with the taxation in different states.

Fuel Prices

Little change is expected in the base price of fuel. Most furnace oils make satisfactory Diesel fuels. The price of coal controls the market price of furnace oil. This is because Diesel fuel consumption is only a small percentage of the total production of this kind of oil, the greater share being used in furnaces in competition to coal.

The market trends seem to be in favor of petroleum. Labor is the chief influencing factor in the price of coal. Thus, future coal prices will be more or less established by labor and the market trend is upward.

With petroleum products, there is an assurance of fairly extensive stores, as new fields are continuously being discovered. Labor is a very minor item in production, refining, and transportation. Newer refining processes are continuously improving the reclamation and quality — a definite influence toward a cheaper product.

Development

The Diesel principle is not new; it is approximately as old as the Otto-cycle gasoline engine.

In its evolution of design development, through its progressive stages of similarity to steam engines, then gasoline engines, and finally to its present form, it has been handicapped by mechanical problems. The automotive engine has contributed much in the way of new and better materials, tools, and methods that have been of considerable assistance in perfecting modern Diesel design.

Important problems were presented with the reduction of cylinder sizes. Picture, if you will, the matter of accurately metering a quantity of fuel of about one half the size of a grain of rice, every 1/1000th of a second, and injecting it into a cylinder under pressures ranging up to 20,000 lbs. per sq. in.

There are some machinists that might relish the task of lapping a plunger to a pump barrel so that the tolerance will be approximately 25 millionths of an inch, using nitrology steel which is 3 to 4 times as hard as tool steel. Today modern industry does these things in its stride.

Diesels in Automobiles

Those who want to ask "When are we going to have Diesel engines in automobiles?" may be answered, "You can have them today if you are willing to put up with them." It must be remembered, however, that the Diesel-cylinder bores would have to be fairly large in size in order to give a comparable power range because of the maximum speed limitation which is about one half that found in the modern automobiles. Supposing a 2-cycle, 3-cylinder engine, which has the power equivalent of the avarage-size car and the same number of power impulses as a 6-cylinder 4-cycle engine, were installed. This Diesel is a finely balanced engine, nevertheless, combustion roughness would be noticeable at idling speeds, due to the torque reaction caused by the much higher compression ratio.

Let us assume, however, that this would not be objectionable. There is little difference in performance. True, the Diesel engine has greater torque or lugging capacity, but that is of advantage chiefly to trucks in improving low-gear performance. The fundamental reason for a Diesel is a matter of economics. Your car, with Diesel equipment, would have to be driven over 40,000 miles per year to justify the initial investment with the resultant savings. Who wants to drive that far in a year?

Now with trucks it is a different story, it may take only 5 months for a truck Diesel to pay out, but in that time the truck may have traveled upward of 40,000 miles.

Dr. Diesel?

Why is the word *Diesel* such a popular term among the public today? Chiefly because few people come into sufficient contact with Diesel engines to be thoroughly acquainted with the product and its place in the prime mover field. With little being known about the Diesel, a certain aura of mystery surrounds it. Some people get the notion that it is practically perpetual motion and is therefore the panacea for all power problems. The millennium has not yet been reached. Hand in hand with this mystery, the romance of the rails is being aroused again, now that Diesels are applied to the railroads, so here we have the element lending the spice of adventure. As a matter of fact, as soon as the novelty is worn off, a ride in the front end of a Diesel streamliner is about as prosaic as standing beside the motorman of a street car.

Not forgetting the third angle of imaginative appeals, that of glamor, these engines are "sleek" looking, and being of relatively slow speed, they tick off the revolutions like a watch, with a rhythm that affects all who are mechanically-minded like the tempo of music affects a Jitterbug.

Opportunity

Getting down to the point which you are most interested in, what opportunities does the Diesel engine afford to the skilled trades? There is no reason, from an automotive standpoint, why the Diesel should be divorced from the gasoline engine. A good automotive mechanic can quickly learn how to handle any Diesel problem. Of chief import, he has to be a little more precise and exacting in his work. This is the same qualification required in the aircraft industry. Such a qualification is the key that spells success in the automotive industry.

I am emphasizing the automotive angle

because it is perhaps the most important, from a vocational-training standpoint.

The mechanic applying for service work on trucks and possibly tractor engines would undoubtedly be better equipped if he were thoroughly grounded in the principles and general servicing technique of high-speed automotive Diesel engines. Without question, certain classes of truck transportation will Dieselize their equipment to a certain extent. For some time to come, Diesel service facilities won't be found in the average repair shop. Specialty shops, featuring injector-service equipment generally under franchise, engine-manufacturer distributors, truck distributors, and fleet-owner service stations, now handle most of the Diesel service business.

Diesel Service Simplicity

On all but a few types of Diesels, the injection equipment can be serviced in much the same way as a magneto — dismantled from the engine, sent in to an authorized repair depot, and then reassembled to the engine. The balance of the service work on the Diesel is simply a matter of conforming to the manufacturer's recommendation, just ordinary engine work — fitting rings and pistons, grinding valves, adjusting bearings, and the like.

Representative manufacturers send training crews around to instruct their dealers' mechanics. For the most part, these mechanics have had no previous Diesel training. This field training is more thorough than similar work conducted by large automotive concerns. The sessions are, of course, limited to dealers and customers' service men.

General Diesel Training

In addition to instruction on the engine itself, certain additional training is in order. Some of the most essential subjects are:

1. A thorough knowledge of fuels and their proper handling.
2. Fuel and lube oil filters and air cleaners.
3. The different types of lubricating oils, in particular, specially compounded Diesel oils, and the types of engines where they should and should not be used.
4. In a few cases, a knowledge of good installation practice wouldn't do any harm.

Truck Replacement

This refers specially to replacement of truck engines and the occasional stationary application. While the responsibility for a correct installation is generally up to the sales engineer, it is always left to the mechanic to do the job of installing. Much of this requisite knowledge of trucks is fundamental and would apply equally well to gasoline as well as Diesel engines. At the moment, there is quite a trend toward the replacement of gasoline truck engines with Diesels. This situation, of course, will rapidly adjust itself now that truck manufacturers are offering a fairly complete range of Diesel power as original equipment.

Engine replacement in trucks is certainly not new; it is not uncommon for one truck chassis to outwear two or three gasoline engines. Now that Diesels are designed so that all wearing parts are replaceable, once a Diesel engine is installed it probably won't be replaced, provided, of course, it performs properly.

Large trucks do not necessarily carry the same standard equipment. Special transmissions, rear-axle ratios, and tire sizes are available, depending upon the type of service required. This range is from heavy-duty slow-speed work, such as in a gravel pit, up to fast highway transportation.

Occasionally, a truck doesn't quite fit an owner's load, speed, and grade requirements. This may influence a change in size as well as in the transmission and rear-axle ratio. Performance figures can easily be reduced to a common denominator, no engineering knowledge being required. The power range of an engine expressed in the rim pull on the rear wheels can easily be applied to a curve sheet to determine given load, grade, and speed characteristics.

Specialized knowledge may also be required in Diesel electric starting and generating systems as they are somewhat different due to the large voltage used, and also there may be fundamental recommendations for the muffler and exhaust systems.

A certain amount of study would be in order on the types of speed-control governors that are used.

With respect to small stationary applications, there are a few points to consider in line with good practice in regard to fuel supply, foundations, muffling, and power application. Of chief import is a general knowledge of the heat-dissipating requirements of the cooling system.

Large Diesel Plants

In other fields of Diesel application such as large power plants, streamline-train locomotives and marine installations, the training of the operating engineer is an entirely different problem. Almost anyone would be bewildered if confronted with an array of all the different types of large Diesel engines on the market. There are few who could claim to know how to overhaul all the different types of valve gears. In this large engine field, there are no general repair mechanics who are expected to have such knowledge. In case of a new Diesel power-plant installation, one of the factory test or erection men is frequently employed to become plant engineer. If a plant is being converted to Diesel from steam, the engine manufacturer generally trains the existing plant engineer. It is not difficult for a man who understands steam engines to become versed in one particular make of Diesel engine.

With the railroads, there is such a thing as seniority, and main-line enginemen with years of steam service behind them, fairly fight for the job of operating a streamliner, and put particular emphasis on their seniority rating. Why not? Diesel-train operation is simpler, cleaner, and much more comfortable than running a steam locomotive.

Special factory training crews handle the instruction of maintenance and operating crews, so there appears to be little change in the way of personnel requirements by the railroads.

Marine Engines

In marine work, the marine engineer first of all, has to have a license as such. Here again the factory supplies the necessary instruction. In all three cases, a factory man frequently stays right on the job for a month or two to insure satisfactory operation.

Men Needed

In all of these instances of Diesel application, there seems to be no crying need for the recruiting of special men to handle the Diesel business.

If the ordinary truck driver needs to know any more about a Diesel than he does about a gasoline engine, to the extent that special training is required, then there isn't much future for the Diesel engine.

In connection with the sale of Diesel equipment, the special training required by salesmen isn't so much in respect to the engine. The engine, after all, is a prime mover, the same as an electric motor, a steam turbine, or a gasoline engine. His problems are, therefore, technical and require a knowledge of power analysis and requirements. There is a limited need for such a man and I am sure you will all agree that it takes a complete college engineering course to prepare him.

Arriving at the final classification of labor involved with the Diesel engine, that is, the production of Diesel engines at the factory, the need is for trained men, but they must be men trained as machinists, toolmakers, die sinkers, etc. Their craftsmanship is not concerned with Diesel. At the Diesel factory, college-trained engineers do the designing research, testing, and application. The rest of the work is mostly a matter of shop production.

Nothing in the world can take the place of persistence. Talent will not; nothing is more common than unsuccessful men with talent. Genius will not; unrewarded genius is almost a proverb. Education will not; the world is full of educated derelicts. Persistence and determination alone are omnipotent. The slogan "press on" has solved and will solve the problem of the human race. — *Calvin Coolidge.*

The best way to eliminate our crime and social problems of tomorrow is in the proper training and guidance of our boys and girls today. — *Martin Vanbee.*

Education in the Industrial Arts

D. M. Schweickhard

Assistant Superintendent of Schools, Minneapolis, Minnesota

This article is specially significant since the Minneapolis school system will shortly celebrate the fiftieth anniversary of the introduction of industrial arts in its public schools.

In the world of human affairs there is on every hand evidence of conflict between the forces which would cling to the old and those which would seek out and recognize the value of that which is new. Habit is such a potent factor in human thinking and acting that it often constitutes an obstacle to progress toward goals which are more desirable than those already attained. However, when the habit of always seeking something new merely because it is new becomes too firmly entrenched, the effects upon the individual or upon society are likely to be fully as disastrous. The procedure most productive of beneficial results is that which constantly examines and checks the past to keep aware of its comparative assets and liabilities, while at the same time seeking in the present and future ways and means for improvement.

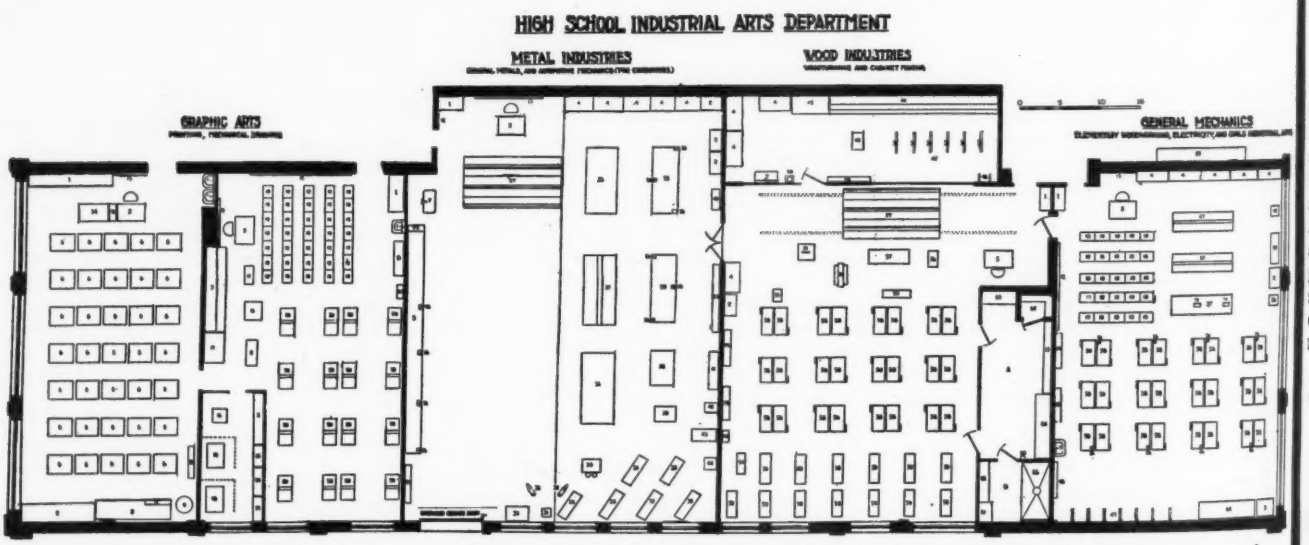
It was this quest for a better way which first brought a formal plan of education, largely academic, out of man's unorganized efforts to educate himself. Much more recently it was the same quest which led to the introduction of fields of work into school curriculums which carried with them values of practical application outside the school, but not formerly considered worthy of the name education. Many educators, catching the spirit of progress, and seeking to carry the movement still further, have finally seized upon these special fields of activity or endeavor, and have come to look upon each as a spoke in the wheel of education. The successive stages in each case have been: (1) oblivion, (2) resistance, (3) passive acceptance, (4) positive reception, and (5) educational absorption.

The Broad Field of Industrial Arts

One of the major fields of human endeavor which has had this experience is the one embracing the great scope of industrial arts. In fact the absorption has become so complete in many educational circles that the name *industrial arts* means nothing larger than a subject or set of subjects in the school curriculum. It is recognized as a valuable field serving as one of the foundation stones of the whole school plan, and often constitutes a strong appeal for financial support in the name of practical education.

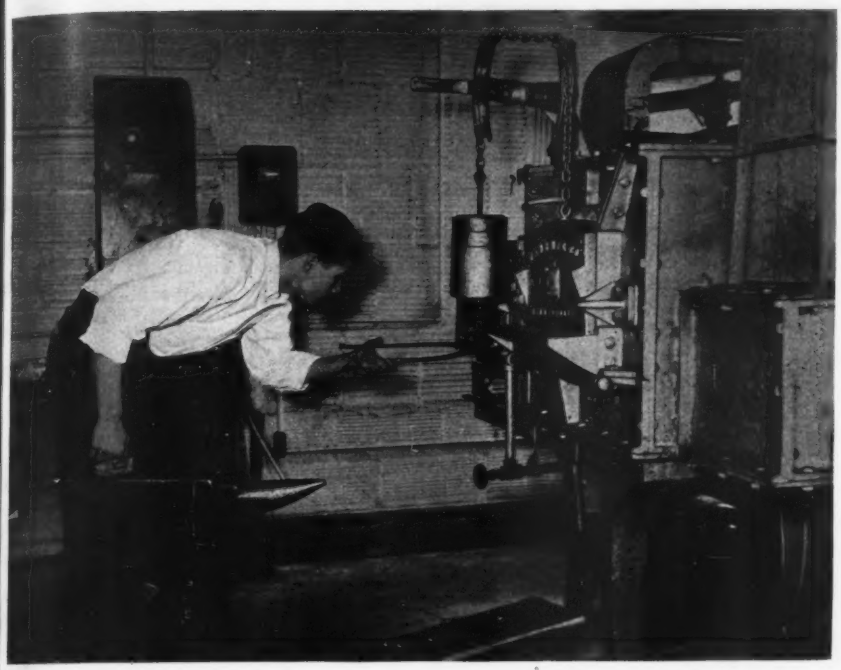
This great field of endeavor, which has so recently come to be recognized for its true worth, is even now in danger of becoming fossilized. The effort everywhere seems to be to fit a few of the numerous industrial arts into the established plan of education, when the more fruitful undertaking would be to modify or adapt some of the standard school plans toward the end of providing more adequate and widespread education in the industrial arts. For after all in the broadest sense this is not a school subject, but rather a great field of activities by means of which the natural resources of the earth are rendered more appropriate or desirable for human use or consumption. Mere reference to a good index to periodical literature reveals a major section devoted to industrial arts, not as a subject in school, but as a variety of activities in which people are engaged.

As school people, let us not think that because we have taken a handful of these arts into the schools, we may put with them a few academic subjects, and thus weave the fabric of a complete education, forgetting that scores of others are still going on in the outside world. Such representative fields as can be offered in the



A model shop section for a large urban high school showing rooms for printing, mechanical drawing, general metalwork, automotive work, wood turning, cabinetmaking, elementary woodworking, and electricity.

1. Wardrobe and supply cabinet
2. Supply cabinet
3. Paper cabinet
4. Storage cabinets
5. Teacher's desk
6. Drawing tables
7. Laboratory
8. Workbenches
9. Blueprint machine
10. Washer
11. B. & W. machine
12. Display boards
13. Blackboards
14. Reference table
15. Proof press
16. Imposing stone
17. Paper cutter
18. Printing presses
19. Opera seats (tablet arms)
20. Type stands
21. Galley cabinet
22. Stick cabinet
23. Drying rack
24. Ink cabinet
25. Workbench
26. Metal vises
27. Movable bleachers (on casters)
28. Testing tank
29. Wall tool cabinet
30. Motor analyzer
31. Gas forge
32. Anvils
33. Metal spinning lathe
34. Welding table
35. Machine lathes
36. Machine bench
37. Soldering table
38. Molding stand
39. Shear
40. Buffer and grinder
41. Brake
42. Power hack saw
43. Shaper, metal
44. Drill press
45. Short stock rack
46. Rack for unfinished projects
47. Lumber rack
48. Clamp rack
49. Veneer press
50. Glue pot
51. Table saw
52. Planer
53. Band saw
54. Wood shaper
55. Jointer
56. Jigsaw
57. Demonstration bench
58. Wood bench
59. Wood lathes
60. Grinder
61. Metal cabinet
62. Shelves
63. Drying shelves
64. Finishing bench
65. Explosion-proof storage
66. Spray booth
67. Electrical test benches
68. Sprinkler shut-off
69. Display case
70. Filing cabinet
71. Soldering furnaces



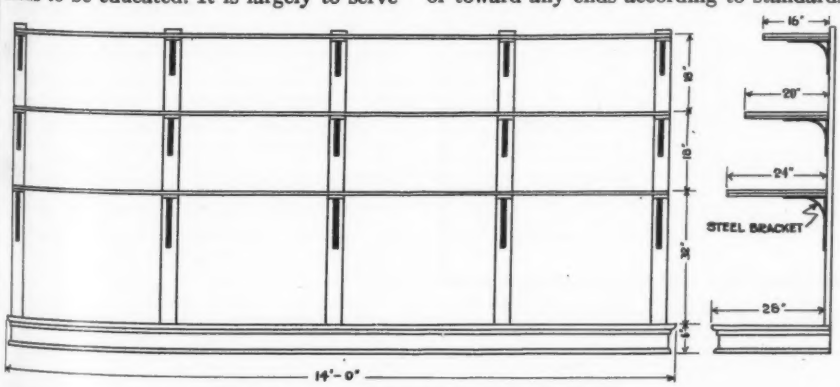
The newest industrial-arts laboratories are furnished with ingenious small machinery and furnaces for doing the widest variety of hot and cold metalworking. In the illustration a student of West High School, Minneapolis, is hardening the arbor for a turning lathe which he is making.

school itself should be looked upon as illustrative only, both in the knowledge attained and in the skills acquired, but real education in the industrial arts must be extended from the walls of the school into the home and into the world beyond.

The Purposes of Industrial-Arts Courses

Education having to do with the industrial arts may vary in its nature, method, approach, and emphasis, depending upon the group to be served and the ends to be sought. For those seeking vocational entrance in a given industrial art the skill and knowledge must be of such expertness and specific application as to be vocationally marketable. For every individual regardless of his vocational occupation there still remains the wealth of industrial arts concerning which he wishes to be and needs to be educated. It is largely to serve this purpose that education in the industrial arts is undertaken in the high school.

This nonvocational emphasis is too often interpreted as discounting the importance of quality in manipulative performance and related knowledge, but such is in nowise the case. The difference is in amount rather than in kind, and every element covered should be vocationally acceptable and capable of being built upon for vocational ends if necessary. The work of the early years in high school is frequently referred to as having some value in the choosing of a lifework, but it is difficult to see how a little work in a few of the industrial arts can be of much worth in that direction unless it represents vocational standards which are fundamentally correct. Regardless of the ultimate outcome there seems little justification for seeking to educate in any field or in any direction or toward any ends according to standards which are known to be false or hypothetical.



STORAGE SHELF SPACE FOR UNFINISHED PROJECTS

Economical storage shelves for industrial-arts shops. These allow for the storage of heavy and light articles of various sizes.

Boys and girls of today are not fundamentally different from those of other generations. They like to do things that are real. They take delight in accomplishing that which is difficult. They rejoice in creative endeavor. They derive joy from that which is beautiful and perfect. They like to experiment and to feel the thrill of pioneering effort. They like to feel that they are essential in the world in which they exist, and to look forward to being even more essential when they take places in the world of adult affairs. They tingle with delight over the mastery of manipulative skills, and their souls are enlarged by each bit of knowledge which is acquired after a quest.

Inclusive vs. Narrow Courses

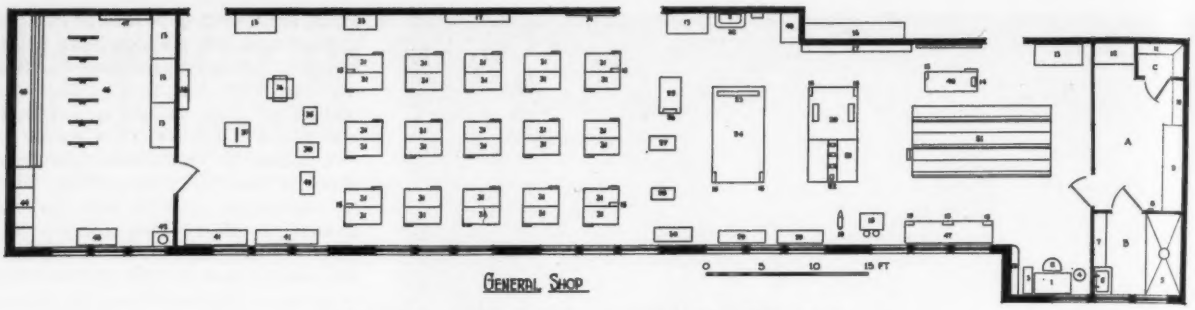
When educators get hold of these things which thrill the hearts of boys and girls, educational objectives are developed out of them and then they are not so easily recognized. If we would leave them as they are, however, we would find generous opportunity for their fulfillment in the world of industrial arts as represented in the school shops. The variety may be limited, but through a wise selection of those which are offered the way is opened for a glimpse at all the rest.

Once we admit that the industrial arts occupy a major portion of the vocational life of the world, and assume that boys, and in many cases girls, should be educated to know these arts and become skilled in some of them, the problem becomes one of how best to provide this education and training. So far as the knowledge is concerned it is conceivable that it might be gained to some degree in a school with no shops whatever, merely by utilizing such means as printed matter, pictures, films, and field observation. At the other extreme it is possible to attempt an extremely varied and elaborate installation of equipment in the school for actual practice in a large number of separate industrial activities.

Just as in most other fields of human endeavor, a middle path seems to be altogether most desirable, from the standpoint of both education and economy. To provide a broad and varied fund of knowledge, from the sources mentioned above, and opportunity for typical or illustrative manipulation seems to offer a combination which in most cases is extremely satisfactory. When viewed in the large, the numerous industrial arts may be grouped into a few major divisions within which there are found to be common elements. In the school where the number of students is small, and one or two teachers handle the entire field, with perhaps even some other duties added, there need be no more than two general divisions of the industrial arts in the educational plan, namely, the (1) graphic arts and (2) the shop crafts.

Graphic Arts and Shop Crafts

Education in the graphic arts will include all the industrial arts whereby



Layout for a general shop in a metropolitan high school.

1. Desk
2. Chair
3. Filing cabinet
4. Wastebasket
5. Spray booth
6. Acidproof sink
7. Worktable
8. Sprinkler shut-off valve
9. Wood-finishing bench
10. Storage shelves
11. Shelves
12. Drying rack
13. Storage cabinets
14. Stake plate
15. Machinists' vise
16. Wall display case
17. Wall tool cabinet
18. Welding table
19. Anvil
20. Stake bench
21. Soldering bench
22. Gas forge
23. Bar folder
24. Layout table
25. Tool-sharpening bench
26. Miter box
27. Grinder and buffer
28. Drill press
29. Machine lathes
30. Metal spinning lathe
31. Woodworking benches
32. Lavatory
33. Hardware cabinet
34. Bulletin board
35. Wood shaper
36. Planer
37. Table saw
38. Jointer
39. Band saw
40. Jigsaw
41. Wood lathes
42. Glue pot
43. Veneer press
44. Short stock bins
45. Shelves for unfinished projects
46. Lumber rack
47. Clamp rack
48. Demonstration bench
49. Wardrobe cabinet
50. Bookcase
51. Bleachers

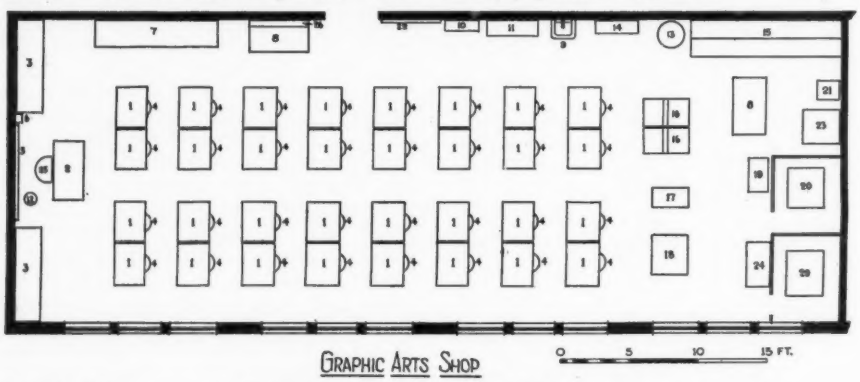
thoughts, information, and ideas are transmitted by means of graphic representation. The school subjects most commonly utilized in this field are mechanical drawing and printing. Even though these two have been commonly treated as separate subjects it becomes a fairly simple matter to combine them in one room with a considerable saving in equipment, space, and teacher energy.

Under the same condition of limited numbers manipulative work in the shop crafts may be carried on in a single room designated as a general shop. Just as the smaller community offers many opportunities outside the school for the general education of its boys and girls not possible in the highly organized city, so the general shop opens the way for a more perfectly amalgamated education in the shop crafts than is easily attainable in a series of separate shops. This should not be taken to mean, however, that a school realizing the need for doubling its shop facilities should install another identical general shop.

In the single general shop there should be included equipment and facilities for manipulative work in as many kinds of materials as the needs of the community demand and its resources permit. Wood and metal, of course, are the basic ones, and should constitute the beginning. Attention should be given to the hand phases and the power phases of work in the materials utilized, seeking to avoid overemphasis on either, and keeping practice in the school so far as possible abreast with developments in industry. With a well-planned course of study and an opportunity for the exercise of individual ingenuity and initiative such a general shop offers well-nigh unlimited possibilities for education in the shop-craft phases of the industrial arts.

A Workable Arrangement

As the size and enrollment of the school increase more teachers are required to handle an adequate department of industrial arts. A very convenient and workable situation is the one in a four-year or six-year high school large enough to economically utilize the service of five teachers. In such a situation the graphic arts may be located adjacent to one another, but divided into (1) mechanical drawing and (2) printing. Likewise, the shop crafts, while covering ground similar to that covered in the smaller school, may be divided into (3) metal industries, (4) wood industries, and (5) general mechanics.



1. Drawing tables
2. Teacher's desk
3. Supply cabinet
4. Stools
5. Blackboard
6. Telephone
7. Type cabinets
8. Worktable
9. Lavatory
10. Composing stick cabinet
11. Galley cabinet
12. Wastebasket
13. Blueprint machine
14. Black and white machine
15. Paper supply cabinet
16. Type stands (student)
17. Proof press
18. Imposing stone
19. Ink cabinet
20. Job presses
21. Hand press
22. Bulletin board
23. Paper cutter
24. Drying rack
25. Chair
26. Instrument cabinet

The expansion provides mainly for the accommodation of larger numbers of students, but may serve likewise in some instances to enlarge the scope of activities attempted and to broaden the fields of application. A casual glance at the physical arrangement of such a plan might suggest the stilted and prosaic offering of mechanical drawing, printing, metalwork, woodwork, and tinkering. When it is borne in mind that these units of space are merely the bases of operation for something much more far reaching than a few manipulative courses, an appreciation of their significance begins to emerge.

There need be no apology in saying that in this sort of a place youth will find opportunity to do the things they like to do for interest thus stimulated constitutes the initial approach to sound learning. Under the wise leadership of capable teachers they may be guided, not from what they like to do to what they dislike and thus feel like an animal enticed into a trap, but rather from a state of liking simple things to one of liking complex and difficult things because the path of education which has led to them has opened the way of understanding.

A half century ago the high school fulfilled its purpose if it prepared its graduates adequately for college. A generation ago a few shop subjects served to make school a little more attractive for those not so much interested in an academic or collegiate career. Today the high school would be sadly lacking in its task of educating the oncoming generation for life if it were to neglect this all-important field of education for the industrial arts.

What we do upon some great occasion will probably depend on what we already are; and what we are will be the result of previous years of self-discipline. — *H. P. Liddon.*

If you want to succeed in the world you must make your own opportunities as you go on. The man who waits for some seventh wave to toss him on dry land will find that the seventh wave is a long time acoming. — *John B. Gaugh.*

Processes for Enriching Metal Projects

Emerson W. Manzer

Bronxville, New York

Fashioning articles of beauty and utility has been a practice of craft-minded people for many centuries. Throughout the ages man has made things and enriched the things he made. In our museums one can find examples of beautiful things made of gold, silver, iron, wood, stone, bone, leather, and pewter. They all show some form of enrichment done with simple tools and processes. The commonplace things were made uncommon by the application of processes that tend to enrich and beautify. Whether one examines the work of the stone-age man, the American Indian, our early colonists, or the craftsman of today, there can be found examples of functional enrichment. The reason for this cannot be defined, except in one way: Man always strives for the beautiful.

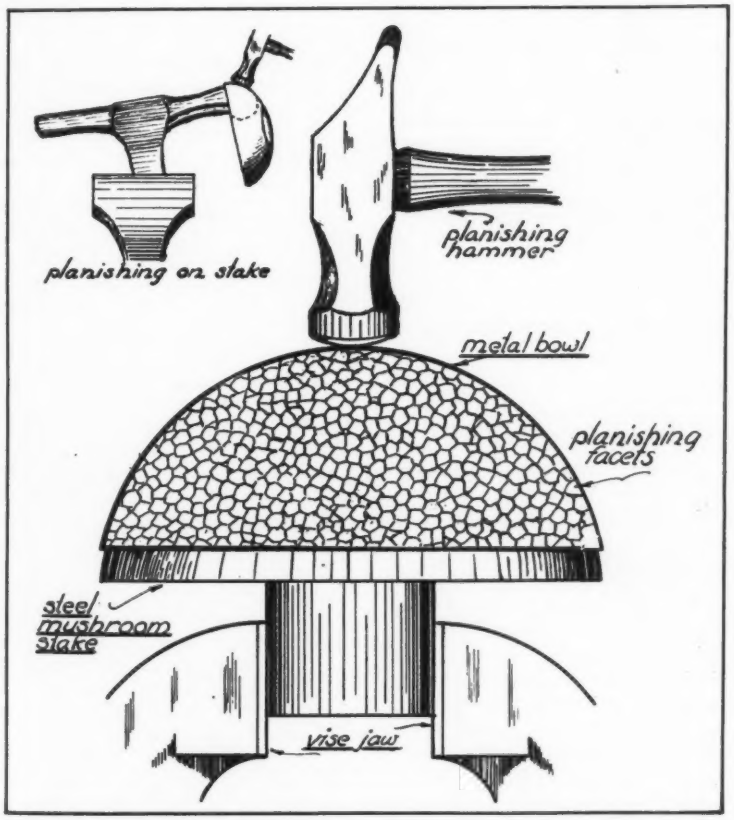


Fig. 1. Planishing is a refining and perfecting process that produces the hand-wrought effect so desirable in all metal-craft work

During the past few years, an increasing interest in all forms of craftwork is apparent. Metalcraft has been revived in schools, hospitals, recreation centers, and adult-education programs. Men, women, and children are using their leisure for the cultivation of craft skills, either for remunerative purposes or for cultural value, and many shop instructors have found a new interest in adding metalcraft to their programs. All of these interests have aided in the American Renaissance of craftwork. Projects of the school shops can be further enriched through the proper use of line and form, through relative proportions of various parts, and through the use of processes adaptable to the materials being used. The purpose of this article is to present various metal processes that will enrich and beautify the projects of the general or art-metal shops. They may be known to some readers, but they may also be new to others.

Finishing. Planishing is a refining and perfecting process that produces a hand-wrought texture so desirable in all metalcraft work. Bowls that have been rough-raised on a stake or formed in a concave form, need planishing to refine the irregular surfaces and to remove factory imperfections. Flat surfaces also need to be planished to free the surface of mill or shop marks and to enrich its beauty.

The planishing-hammer face is smooth and slightly rounded. The center of the hammer strikes the metal and produces a slight faceted surface mark. If the hammer is not held correctly, the edge of the hammer face will strike the metal and leave a curved mark called a *moon*. Should this occur, the *moon* may be hammered out by striking several light blows around the mark. Heavy hammer strokes will stretch the metal too much around the moon area and invite trouble. Striking hard with the planishing hammer will produce large facets which are adapted only to large pieces of work. Smaller objects demand smaller facets to make the surface enrichment harmonize with the project. Facets of the same quality can be obtained only by gauging the power stroke of the planishing hammer.

Specific directions for the worker in metal.

The planishing operation on a vase that was made from a single piece of metal

In planishing a flat surface, start at the center of the work and hammer toward the edges. Metal expands when hammered, and by hammering toward the edges, provision is made for this characteristic. Do not class planishing with ordinary hammering. It is not a hit-or-miss process. As stated before, it is a perfecting and refining process and should receive the utmost attention.

To produce a first-class planishing job, start one row of hammer marks, making them overlap each other a trifle. See Figure 1. The next row of marks will overlap the first row. Any unhammered area showing between the planishing marks is called an *island,* and must be removed by additional hammer strokes. Carry out the planishing until the edges have been reached. Flat planishing may be done on a smooth surface plate, the bottom of an old flatiron or a thick piece of metal that is smooth.

In planishing a spun or hand-wrought bowl, select the metal stake that is best suited for the desired shape of the bowl.

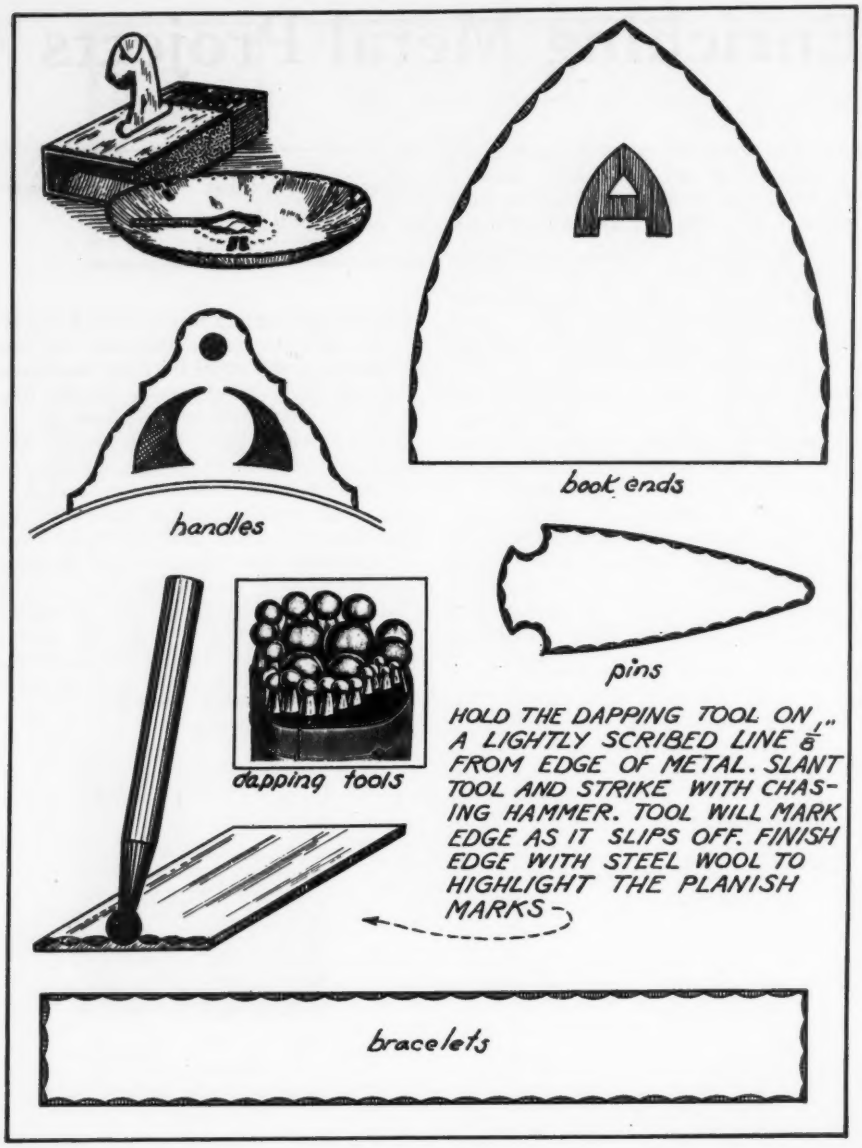

book ends
handles
pins
dapping tools
HOLD THE DAPPING TOOL ON A LIGHTLY SCRIBED LINE 1/8" FROM EDGE OF METAL. SLANT TOOL AND STRIKE WITH CHASING HAMMER. TOOL WILL MARK EDGE AS IT SLIPS OFF. FINISH EDGE WITH STEEL WOOL TO HIGHLIGHT THE PLANISH MARKS
bracelets

Fig. 2. Edge planishing

Be sure that the stake is free from any surface marks. A smooth stake, with a scar-free surface, is one of the most valuable assets the craft shop can possess. *The surface of a stake should never be hit directly with any type of hammer.* To deface a stake surface or the smooth surface of a hammer is considered one of the worst technical crimes that could be committed in a craft shop. It is a good policy to keep stakes covered with a leather cap when they are not in use.

After selecting the proper stake, place the bowl over the stake as shown in Figure 1, and with a fiber or wood mallet smooth out the uneven surfaces of the bowl that were caused by the rough raising. Next select the planishing hammer, polish its face on the buffer, and start planishing at the center of the inverted bowl. Try for even strokes that overlay slightly, and for marks of even size. Planish in overlapping circles, moving the bowl on the stake, or moving the hammer whichever is the most practical. Do not hammer too much in one spot, or the metal will increase at this place and cause some difficulty. Carry on with this process until the edge of the bowl has been reached. To refine the planishing further, repeat the process, making the planishing marks smaller. If the bowl is made of metal that requires annealing, this must be done before the second planishing. Clean the annealed metal in a bright dip solution, to remove fire scale.

After the bowl has been satisfactorily planished, and the edges and bottom have been perfected, the piece should be buffed to soften the hammer marks or facets.

Edge Planishing. Many projects may be greatly enriched by simple edge planishing. Figure 2 shows how this process is carried out. Take the ball end of a chasing hammer or a large dapping tool, set it on the edge of the metal and strike it with a fiber or rawhide mallet. The resulting planishing marks, will, if well placed, add much to the contour enrichment of the project. Hold the dapping tool on a lightly scribed line about 1/16 in. from the edge of the metal. Slant the tool and strike with a mallet or hammer. The tool will mark the edge as it slips off. Small objects like pins, buckles, and the like, need small-edge planishing marks. The planishing marks on the book end shown in Figure 2 are much larger.

Cross Peening. Cross peening, as shown in Figure 3, gives an enriched surface, hardens the metal, and provides an excellent surface for coloring or oxidizing. The tool used for this process is called the raising hammer. The marks made by this hammer are long and narrow and may be used on either circular or rectangular flatwork. On circular work, all of the cross peenings should point to or radiate from a center, while on other work the peening generally follows the longer dimension.

Spot Hammering. Several hammers are adapted for this type of enrichment. The small ball-peen hammer, the chasing hammer, or ball end of small planishing hammer, may be successfully used. On small work such as bracelets, pins, and napkin clips, the spot hammering must be very fine. Large-spot hammering looks ugly and should never be used. This surface treatment also provides a good ground for the further enrichment of the metal by oxidization, the low spots remaining dark while the high spots of the metal are rubbed to make them bright. The oval enrichment of the colonial book ends, in Figure 4, consists of some fine-textured spot hammering.

Fig. 3. Book end with edge planishing and cross-peened surface. Note pierced design

Overlaying. Initials, designs, and silhouettes, when cut out of metal and attached to the surface of a project, form an overlay enrichment. The overlay metal may be of the same kind as the project, or it may be of contrasting metal. The surface of the overlay design may be planished, spot-hammered, enameled, or colored with acid solution. Figure 3 shows a good example of overlay design. The two colonial silhouettes were cut out of copper and applied to pewter.

Design Stamping. Designs may be stamped on various kinds of projects to add enrichment or to supplement the design. The stamps may be made of special tool steel purchased in various shapes, or they may be purchased ready made. In planning the design, the metal stamp may be pressed on an inking pad used for rubber stamps, and then pressed on paper. Draw the proposed design on paper and then stamp the design where it belongs. In the case of a circle enrichment, this trial method will determine just how large the circle will have to be in order to punch an equal number of designs around its circumference. The centers of nut dishes, small trays, the rims of small plates, edges of bowls, the surface of book ends, all adapt themselves to this type of enrichment. See Figure 5.

Repoussé. Repoussé is a French word pronounced re-poo-say'. It means to raise

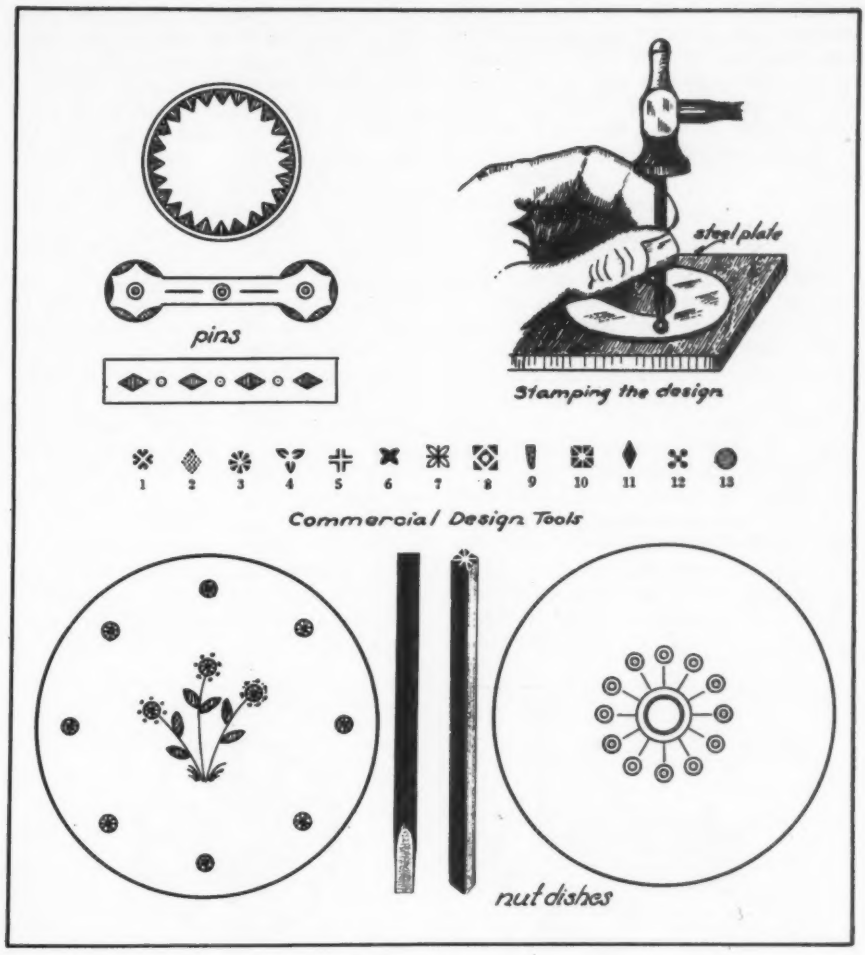


Fig. 5. Designs may be stamped on various kinds of projects to add enrichment or to supplement the design

Fig. 4. Colonial book ends

Fig. 7. Repoussé work showing high and low relief. By Edwin Schulte, metal sculptor

from the back. The term is applied to the enrichment of metal surfaces when designs are to be modeled in relief. This type of enrichment is very effective when well done because it produces a surface that has a combination of light and shade as well as variety of line and form. When the metal is finished with a liver-of-sulphur solution, the light and dark areas are enriched by careful rubbing and finishing, the high areas being finished lighter while the lower areas are left dark or gradually shaded. See Figures 6 and 7.

The metal used for this form of enrichment, must, of necessity, be ductile and of thin gauge. Copper, silver, and pewter, are the metals most used in repoussé work. Silver and copper, because they can be annealed or softened, are considered the better metals. Pewter may be used for designs that are not too detailed. The gauge of metal used will depend upon the use of the project. For example, a small pin, belt buckle, or small overlay design, may be made of No. 20 gauge silver or copper. Book ends or other projects that must serve in various ways will call for a thicker gauge metal. Copper or silver of No. 18 gauge will prove practical if the design to be repousséd is not too small or complicated. After some skill has been obtained in this form of metal art, thicker gauge metals may be used with success.

In planning the design, one must keep in mind the type of enrichment that the project is to receive. Beginners should not try over elaborate designs for their first repoussé work. Start with a design containing large areas, master the technique, and then try projects that call for higher embossing and more chasing of the surface lines or areas. Supplement your practice with good metalcraft books that treat the subject in more detail. There are a number of excellent books that will prove of valuable assistance in this and other forms of metal enrichment.

In order to form the metal to conform to the design, it is essential to place the metal on some kind of material that has some *give* to it. Pitch is considered the best all-round material for repoussé work. It is pliable, holds the metal in place, may be formed to meet the demands of the design, and it may be melted and poured into various hollow-ware projects that are to be ornamented by the repoussé process.

Pitch used for metalcraft work is called

Swedish pitch. Most firms dealing with metalcraft supplies can supply it in bulk form. It cannot be used without the addition of other materials due to its brittle character when it is cold. There are many mixtures used to make the pitch pliable. One of the most successful mixtures is as follows:

Pitch	6 parts
Plaster of paris	8 parts
Venetian turpentine	1 part

Some commercial firms use linseed oil in place of Venetian turpentine. Tallow is another commonly used ingredient. Short candles have been used with great success. The oil, tallow, and turpentine soften the pitch, while the plaster of paris, is the hardening agent. In warm weather, more plaster of paris is used, while in cold weather more of the oils are used.

To make the mixture, melt a little pitch in an old coffee pot or metal pitcher with a large handle. Then add a little more pitch, let it melt, and then add the balance of the pitch. *Use a low flame.* When the pitch is melted, add the plaster of paris, stirring constantly, and adding a small amount at a time. After these two ingredients have been thoroughly mixed, add the turpentine, stirring well to get a good mixture. After the batch is made, pour a small amount in a shallow pan, let it cool, and make a test. If the pitch is too hard, add more Venetian turpentine or throw in some short candles.

When the mixture is of the proper consistency, it may be poured into shallow pitch pans, pitch bowls, on flat surfaces, or small amounts may be poured directly on top of a piece of wood with a hole drilled in the top of the wood to hold the pitch in place. The size of the pitch block will be determined by the size of the metal to be worked. If a flat surface is needed, let the pitch cool sufficiently so that the pitch block may be turned upside down on a slab of stone, or a sheet of metal. Place weights on top of the block and let the pitch set.

The next step is to cut the metal for the design. In order to carry on the repoussé work, it is necessary to cut the metal larger than the design. See Figure 6. The size of the metal depends upon the gauge, the design, and the depth required. Anneal the metal and cleanse while hot in a bright dip to remove the fire scale or oxidization caused by the heat. Various dips may be found in books on metalcraft.

Go over both sides of the metal with fine emery cloth. Paint the better side with white water paint so that the design may be transferred to the metal with carbon paper. Wet the back with a little water so that the metal can be removed from the pitch without much effort. Bend each corner of the metal down about ½ in. and push the *dog ear* (bent corner) into the pitch. The surface of the pitch should be slightly warmed before setting the metal. Do not burn the pitch when this warming is done. Press the metal down with a smooth board to remove all air pockets.

The tools required for repoussé may be purchased or they may be made in the shop. Many craftsmen make tools as they are required. Figure 6 shows the repoussé tools and the hammer most commonly used. The tools consist of bossing tools, tracers, modelers, background or matting tools, ring tools, and punches. They are made of steel in the various shapes shown and are approximately 5 in. long. The ends are hardened and polished.

Tracers are used for outlining the design. They are made in various thicknesses and shapes, the ends being polished so that they are not sharp. Sharp ends and edges would cut the metal instead of forcing it into the pitch. Straight tracers are used for straight lines, while the curved tracers are used to set curved lines. After some experience, the narrow tracers can be used to set the curved lines as well as the straight lines.

The ends of all repoussé tools should be kept in first-class shape by buffing occasionally to keep them smooth and free from rust. Dipping them in oil will make them move freely under the blow of the chasing hammer. The ends of the tracers are beveled about 15 deg. to make the tool move easier and also to get the proper *set* of the tool.

All of the repoussé tools are held between the thumb and the first three fingers of the left hand. See Figure 6. The fourth or little finger rests on the metal. The tool slants away from the direction in which it is to move, the *toe* of the tool being slightly raised so that the trace will be made by the *heel* of the tool. The hammer should strike the tool squarely so that the force of the blow will tend to make the tracing tool travel along the design line. Practice on a small piece of scrap metal may perhaps avoid several errors on the design. The lines of the tool should be smooth and regular. If they show marks of the tool each time it has been struck by the hammer, the technique used is faulty.

When the design has been completely gone over with the tracer, the metal is removed from the pitch. If the metal is slightly warmed and rubbed with a cake of paraffin, the adhering pitch will be dissolved readily and may be wiped off with a rag. The traced design will now show on

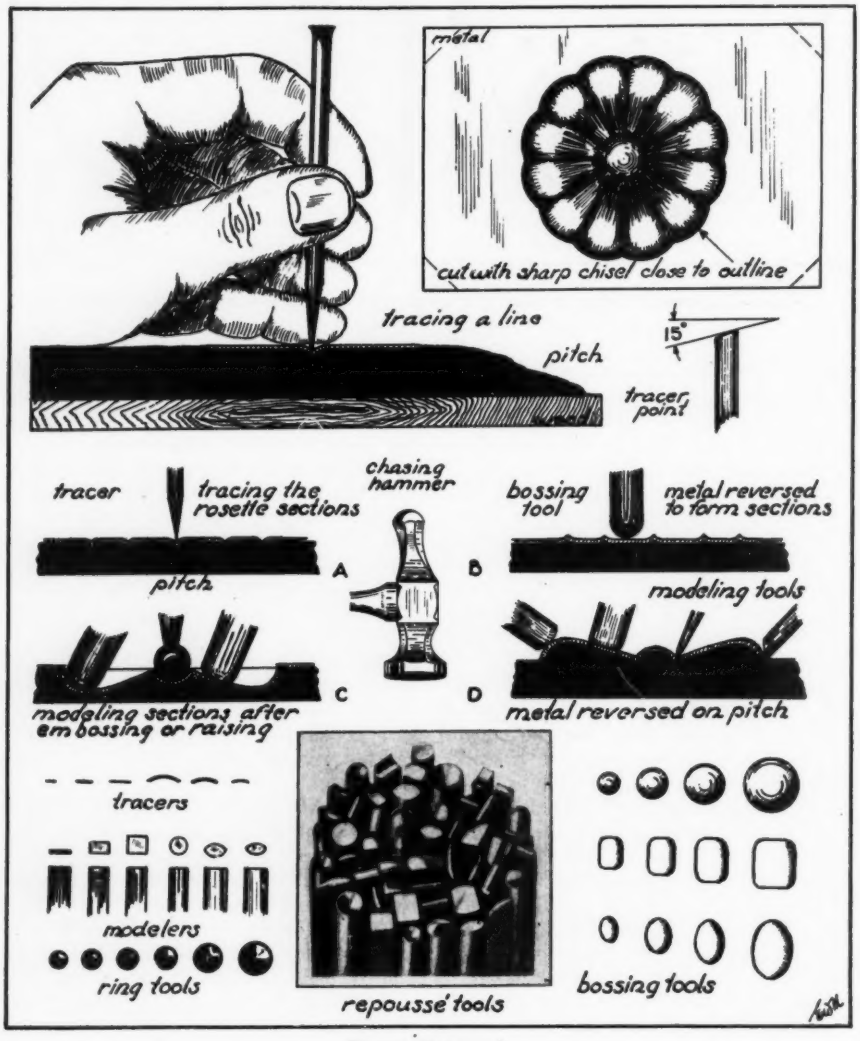


Fig. 6. Repoussé

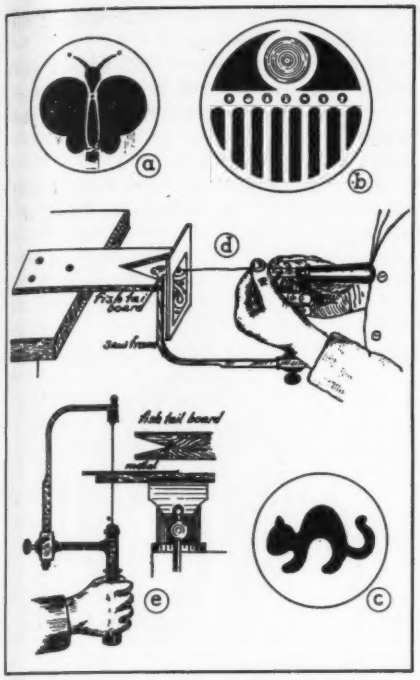


Fig. 8. Piercing is the sawing out of areas around a design so that it will stand out, or that areas cut out make the design. At d *is shown an example where areas are cut around the design. When these pins are worn on colored clothing, the figure is enriched by the colored background. If desired, the figure may be backed by another metal of different color*

At d *is also shown how the saw is threaded for sawing out the areas. The thinner the metal, the finer the saw. It is a good kink to put a piece of oiled cardboard under the metal being cut. This will lubricate the saw and make it last longer. Point the teeth of the saw toward the handle. The saw cuts on the down stroke*

the face of the metal. Heat the pitch to smooth the surface and then set the metal again with the reverse side down so that the deeper areas may be raised. Reverse again to define outline as shown at D in Figure 6. Cut out design with chisel if design only is wanted, as for example when making a pin, a buckle, or an overlay.

Piercing. Piercing is the cutting out of areas around a design or pattern so that the design becomes the center of interest. There are two common methods employed when this form of enrichment is used. The area around the design is cut out as shown at *b* in Figure 8, or the design itself is cut out as shown at *a* and *c* in Figure 8.

Pierced projects, combined with other materials such as contrasting metals, wood, plastics, cork, and leather, aid materially in the production of very effective craftwork. Pierced monograms of metal may be attached to wood, or soldered to metals of contrasting color. Cork designs glued to wood, leather, or metal give a modern effect that is very pleasing. Plastic designs for belt buckles, pins, clips, and buttons, are easily pierced with the jewelers' saw. It is considered very good taste to limit the materials to three when a project is made. Too many different materials tend to make a project gaudy.

The tools used for piercing are the jewelers' saw frame, jewelers' saw blades, a fishtail board, a small drill for drilling holes for the saw, a small hand drill, and a center punch for centering the proposed hole. The fishtail board may be fastened to the bench as shown at *d* at Figure 8, or it may be held in a vise as shown at *e* in Figure 8.

The design may be transferred to the metal or other craft material by several methods. The most practical method for quick work is to cover the surface of the material, if plastics or metal, with a thin coat of white water paint. Clean the surface of the material to remove any trace of oil, and then apply the water paint. Dry by holding the material over a small flame. Transfer the design to the surface of the material by using carbon paper held in place with paper clips, or with a small piece of scotch tape. To insure against damaging the master drawing, it is better to trace the design on thin tracing paper before the transfer is made. The transferred lines are then gone over once more with a sharply pointed steel tool in order to record them on the material in such a way that there will be no loss of contour caused by the obliteration of the transferred line.

The areas to be pierced are cut out with a jewelers' saw. If the material is thin, in the case of metal, the saw blade should have a large number of teeth, while thicker gauge metal requires a smaller number of teeth. Thin metal may be better sawed by placing a piece of cardboard under the metal. If several pieces of metal are to be sawed at one time, place pieces of oiled paper between each piece of metal. The oiled paper will act as a lubricant for the saw.

After the holes are drilled or punched in the areas that are to be cut out, slip the saw through a hole and fasten the saw at one end as shown at *d* in Figure 8. The teeth of the saw should point toward the handle of the saw frame since the cutting action of the saw takes place on the down pull of the saw frame. See *e* in Figure 8. The metal or other material to be cut, is placed near the end of the saw that has been clamped, while the other end of the saw blade is being set. The saw blade is then tightened by sliding the frame through the top screw clamp until the saw has tension. Rub the saw blade with a piece of candle or with an oily rag.

Place the work flat on top of the fishtail board, hold the saw perpendicular and saw slowly without too much forward feed to the saw blade. It must be remembered that metal cuts slower than other material and therefore the saw should not move too rapidly. Speed will heat the saw blade and remove its temper or hardness.

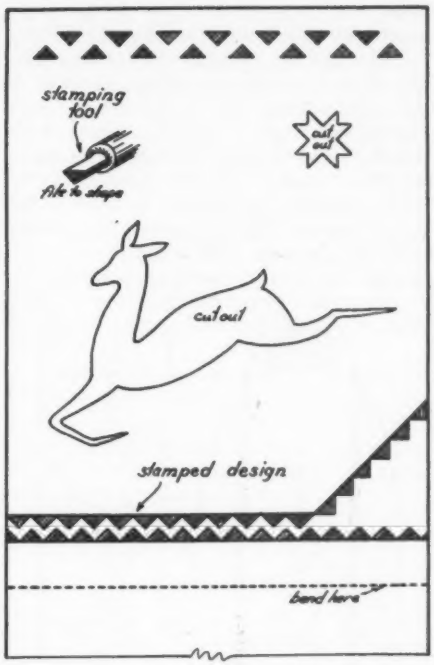


Fig. 9. Piercing with cut-out area design stamped borders

When cutting around corners, the saw blade must be kept in motion so that the saw will cut a space in which it may turn. Many saw blades are broken by forcing them while cutting a corner or sharp curve. Blades are also broken by twisting the saw from side to side, and backing out of a cut line.

Beginners should saw so that the lines of the design remain uncut. After sawing, file to the lines and finish with fine emery cloth. After experience has been gained in piercing, time will be saved by cutting right to the line.

Etching. Etching is a process of engraving, in which a design is produced by the action of an acid or mordant instead of a tool. The process can be applied to any surface such as metal, glass, stone, depending on the use to which it is put, or the effect sought to be reproduced. The two types of metal etching are the line type and the area type. The line etching is produced by covering the clean metal surface with a resistor, and then cutting lines through the resistor with a sharp tool or stylus. The exposed lines are then subject to the action of the acid. The area type of etching is obtained by painting or *blocking out*, with a resistor the metal areas that are not to be eaten by the acid. Figures 10 and 11 show two etched projects.

To prepare the metal for the etching process, clean the surface to be etched, using a power or hand buff and a greaseless buffing compound. Rub the surface of the metal with powdered Vienna lime or flour of pumice stone to kill the gloss so that the traced lines of the design will be visible. It is a good policy to handle the metal with canvas gloves to prevent the metal from

being fingerprinted. If a line design is desired, the metal may be covered with a resistor that can be easily cut through with the stylus. See resistors suggested later in the article. Trace the design directly over the resistor using a sharply pointed hard pencil. This will trace the lines in the resistor. Next, trace over the lines with the stylus, cutting through the resistor to the metal surface. This exposes the design lines through which the acid will etch.

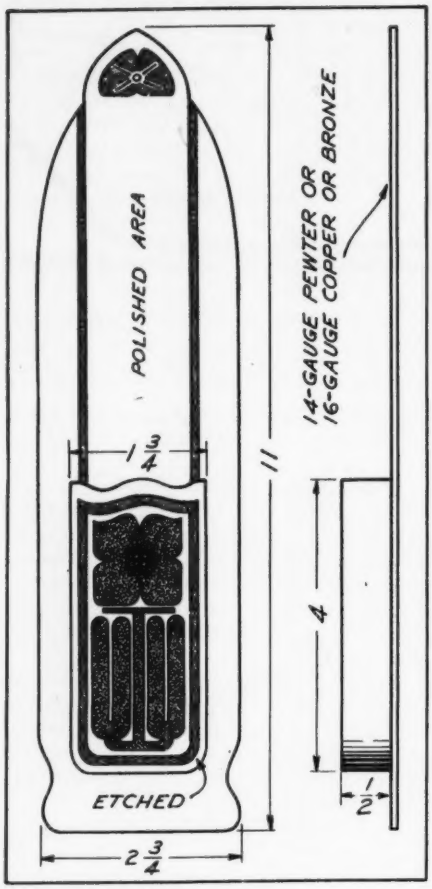


Fig. 10. Wall vase

If the design calls for an area etching, another method must be used. After the metal has been thoroughly cleaned, it is painted with a thin coat of white water paint. When the paint is dry, the design is transferred to the metal. Go over the lines very carefully with a scriber or other sharply pointed tool, transferring the design lines directly to the metal. Wash off the paint and clean the metal as has been previously stated. When the metal is thoroughly dry, it is ready for the application of the acid resistor.

After the areas are painted, each line is checked and corrected by removing any resist that has gone over the marked outline of the design. This is done by using a sharp knife or a power-driven hand tool. If the metal is to be placed in a glass dish partly filled with etching solution, it will be necessary to paint the back and edges of the metal. If the metal is placed on a piece of glass and the edges of the metal banked with wax or paraffin, it is not necessary to paint the edges or the back of the metal. Wax fillet, used by wood patternmakers, makes an excellent edging for the metal. Only a small amount of acid solution is required when this method is used

In order to have a check on the action of the acid on the metal, it is a good plan to make about three small test pieces. Paint each piece with the acid resist, leaving an area or line, as the case may be, for the acid to work on. When the large piece is inserted in the etching solution, insert the test pieces, at the same time recording the time of insertion on a piece of paper. After a half hour or so, remove one of the test pieces to determine the depth of the etching. Later on remove a second test piece. This will show the etching depth of the large piece and will aid in determining just when to remove the larger work.

While the metal is in the etching bath, stroke the areas or lines with a feather or rock the solution so that the lines or areas do not become clogged. This aids materially in producing a good job of etching. If the bubbles coming from the exposed metal show rather large, it is an indication that the acid solution or bath is too strong. Add a little water, rock the solution a bit, and then watch the acid action. Small bubbles indicate slow etching and a better grade of work. Bubbles contain gas which tend to keep the acid away from the metal, hence the necessity of rocking the solution to keep the bubbles from adhering to the surface.

The following etching solutions have been successfully used by commercial firms. The solutions have been taken from *Platers Guidebook*[1] and *Metal Industry Magazine*.

Copper Etching Solutions

1. A dilute solution of nitric acid and water — 5 parts water and 1 part nitric acid. *Caution:* Whenever acid and water are mixed, it is necessary to add the acid to the water. If this is done, the acid is diluted when it strikes the water. If the water is added to the acid, the small amount of water is heated by the larger amount of acid. This action may cause the acid to spatter and strike the body or clothes. *Add acid to water and be safe.*

2. Perchloride of iron may be used on copper — 2 parts iron perchloride to 1 part of water. It may be purchased from any chemical dealer. Agitate the work and heat the solution to 90 deg. or 100 deg. F.

3. Electrolytic method. Use a 5 to 10 per cent solution of muriatic acid and water. Lead cathodes and 6 to 8 volts.

Brass Etching Solution

1. Dilute nitric acid — 1 part acid and 5 parts water.

2. Dissolve 1 part of potassium chlorate in 20 parts of water. Mix separately 3 parts nitric acid with 30 parts water. Then mix the two solutions, allow the gases to escape, stir the solution, and it is ready for use.

[1]*Platers Guidebook*, Metal Industry and Electroplaters Review, 116 John St., New York City.

3. The perchloride of iron solution given.

Steel Etching Solution

1. Mix 2 parts nitric acid with 1 part acetic acid. Acetic acid is strong vinegar.

2. Hydrochloric acid 2 parts and 1 part water.

Zinc Etching Solution

Mix nitric acid 1 part and water 1 part. Add to this ¼ by volume of denatured alcohol.

Fig. 11. Wall ivy holder

Aluminum Etching Solution

Hydrochloric acid 1 part and water 1 part. Test to determine proper strength.

Monel Etching Solution

Sulphuric acid, 1 part; hydrogen peroxide, ¼ part; and water 1 part. Use cold with 6 volts; lead cathodes. If etch is too rough, dilute solution with water. If not fast enough, add more acid.

Pewter Etching Solution

1. Nitric acid, 1 part; water, 5 parts.

2. The copper iron perchloride solution may also be used.

Silver Etching Solution

1. Mix 1 part of nitric acid into 4 parts of water.

2. There are several good commercial silver etching mordants available. These come ready mixed for use.

Nickel Silver Solution

Mix 1 part of nitric acid into 3 parts of water. If large bubbles appear, add more water. Keep bubbles away from lines with a feather. Bubbles contain gas which tends to keep the acid from the metal.

Etching Hardened Steel

Nitric acid, 30 per cent; water, 70 per cent. To each gallon of the solution add 5 oz. of mercuric nitrate.

Etching Grounds

Mix 1 part of white wax, 1 part gum mastic, ½ part asphalt. Pulverize the

mastic and the asphalt, separately. Melt the wax in a container and when hot, add the mastic powder and then the asphalt powder. Stir well while the powder is being mixed. Continue the stirring until the asphalt powder is melted. Remove the container from the fire, allow mixture to cool, and pour into clean warm water. While in the water, knead the mixture with the hands, and finally form it into small cylinders or balls. Wrap the balls in oil paper for further use.[3] Apply this ground, melt the ball and paint on warm metal. If line etching is wanted, heat the metal and rub the surface with a ball of the etching ground.

Transfer Etching Ground

A good etching ink used in the transfer process is made of the following materials:

Beeswax	5 oz.
Egyptian asphalt	¾ oz.
Bayberry wax	1 oz.
Rosin	¼ oz.
Turpentine	1¼ oz.

Melt the first four ingredients over a flame and strain through clean cheesecloth. Then add the turpentine, stir thoroughly, and allow to cool.

The transfer paper is removed by soaking in water and then gently rubbing with a sponge.

This solution may be used in the same manner as the ground solution just given. This ground is used on a printing press.

Stopping-Out Mixture

Frequently it is desirable to *stop out* certain lines that are not to be etched too deep or wide. It should be remembered that the lines get wider the longer they are exposed to the etching bath.

Beeswax, shellac, or common paraffin, dissolved in alcohol, may be applied with a small brush to lines or areas that are not to be etched too deeply.

After checking the test pieces for the desired etching depth, remove the metal from the bath and dip in cold water to remove all the acid. Remove the etching ground with a thinner, such as turpentine or kerosene if asphaltum paint was used. If wax or paraffin ground was used, it may be removed by slightly heating the metal and then wiping the ground off with a clean rag. Go over the metal with fine steel wool to prepare the surface for the desired final finish.

Caution: Never use gasoline, benzine, or naphtha for removing asphaltum etching ground. Gasoline vapor when mixed with air, becomes highly explosive. Remember that a spoonful of gas is all that it takes to make a car climb a steep hill.

[3] *Metal Workers Handy Book*, Brannt, Henry Carey Baird and Co., 2 West 45th St., New York City.

The Bible Method of Teaching Printing

Bert Popowski

Central High School,
Aberdeen, South Dakota

A method for taking care of necessary production work in the printshop.

"How are you able to carry out any systematic instruction along with the volume of production work in your shop?" wrote a fellow printing teacher of another city. "Maybe you have solved the problem and would be willing to lend a helping hand."

Without making any claim to having *solved the problem*, an explanation of the methods which we have found successful in handling a considerable amount of production work in the Central High School printshop of Aberdeen, S. Dak., might be in order.

In the first place, I place my trust in the shop *bible:* a book which contains samples of the 300-odd forms which are in continuous use in the Aberdeen public schools. Whenever changes occur, they are promptly put into this form book and serve as a guard against any lapse of memory.

Dimensions of each type job are indicated in picas on the sheet on which the form is imprinted. Around the imprint runs a dotted line, designating the size of the stock on which it is to be printed, and, in some cases, a notation of the kind of stock and its weight. This latter information is used in the case of those forms which must be printed on a substantial grade of stock in order to stand considerable handling.

A *description form* is printed on the same sheet with the job form. This includes the set length of the type form, the sizes of head and body types used in the job, and the type size of the finished job. Other information includes the office or room number to which the final proof must be taken for O.K., and the paper stock size in inches.

A printing order is attached to every job that comes into the shop. This gives, in addition to the B. E. (book entry) number, the number of copies of the job wanted, when the job is wanted, and any special notes to be observed by the printshop.

The date of its receipt also is placed on the order. If there is no rush about getting the job out, it takes its turn in order of jobs that await setting. If it is a rush job, it is so marked, and given special handling by the more experienced and speedy students.

Let us take the usual job as an example. The printing order (properly signed by the principal, who cancels any printing orders which might better be mimeographed) is dated on receipt and the job is assigned to John Smith. His name is written on the job copy sheet and on the printing order which goes into the instructor's record file. Sometimes two or more boys are assigned on one such job and share the responsibility.

The double use of John's name is a precaution against loss of the copy and gives an accurate checkup as to where to place the responsibility when such a loss does occur. It further enables the instructor to check rapidly and accurately on the progress of the job, and assists in grading each student in the shop.

6-1-36 A John Smith

PRINTING REQUISITION

Date June 6 1936 Requisition No. 19

If this is a reorder, order by B.E. number 126

School or Department for which work is needed City Schools

Number needed 2 000 Signature Chas. J. Battaglia

Remarks * Report to Supt's Office

3 x 5 Postcard Tag

Note: This requisition must accompany work. Final proof to be checked as O. K. by signature of individual requesting work. * Requistor note preference for stock, ink, or special notes to be observed by printer. B. E. 5

OK'd 6-2-36; delivered 6-3-36

A rough estimate of the amount of time necessary for each job is made at the time of assigning it and a simple system of bonus grades is worked out. This higher grade is given if the student completes the job before the period stipulated for it. This keeps the speedy students on their toes and gives the instructor a chance to assign work suited to the individual and hold him to his own capabilities, instead of expecting students of varying skills to maintain the same pace on every job.

If the job is comparatively simple, John swings his pica stick onto it, gets the set length, and goes to work. The B. E. number refers him to a sheet in the shop *bible*, and there he can learn as much about the job as the instructor can tell him.

Figure 1 is a typical example of such a job. By reading the description which accompanies the job, the student learns that his composing stick should be set at 28 picas, and that 10-point Century type is to be used throughout.

It tells him, further, that although the complete job is to be 28 picas in length,

(Continued on page 194)

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

The American Industrial Arts Association

The news of the birth of the American Industrial Arts Association undoubtedly came as a welcome bit of information to many of the friends of industrial arts education. The organization had its origin at the conferences of industrial arts teacher educators held in Cleveland during the meetings of the American Association of School Administrators on February 27 and 28.

The new national association, it is believed, will henceforth continue to meet regularly at the same time that the National Education Association has its various conventions, and it can, therefore, render service by establishing a closer relationship between the industrial arts field and the superintendents, principals, and other school administrators who attend these conventions. In spite of all that has been done and written up to now, and in spite of the industrial arts programs held from time to time at various National Education Association conventions, few of the educational administrators have fully envisioned what an important element the industrial arts are in the general education of the present day. It is sincerely hoped, therefore, that this new venture to further industrial arts work may accomplish this important purpose.

The organization of the new American Industrial Arts Association should not be considered by industrial arts teachers as a valid reason for discontinuing their membership and their interest in the American Vocational Association. There is a growing need for unity between the teachers of industrial arts and the teachers of vocational education. Both of these fields of practical work have been greatly misconstrued by the teachers of the traditional subjects. Unfortunately, too, the spirit of fellowship between the teachers of the vocational subjects and those engaged in the teaching of industrial arts work has not been the most cordial in the past. This state of tension has gradually been lessened as the two groups have labored side by side in the American Vocational Association, and it is to be hoped that a still better understanding be engendered, for industrial arts work is but a preparation for the greater emphasis on the practical skills and technical information required in vocational training. The industrial arts teachers should, therefore, seriously maintain their interest in the older association, even while embracing the new, because the one will establish closer relationships between the industrial arts and vocational education, while the new organization, it is hoped, will create better understanding and better co-operation between the industrial arts teachers and the other members of the general education staff.

With the proper co-operation, then, industrial arts teachers can derive much good from membership in both the American Vocational Association and in the American Industrial Arts Association. May both of these organizations prosper.

These Requisitions

The time of the school year is again approaching when the busy shop instructor will be confronted by the arduous job of requisition writing. Unfortunately, this task which takes much careful consideration, falls at a time of the school year when many other necessary and important things also require attention. This, of course, complicates matters because the making out of requisitions requires not only a knowledge of wants, but also a deep understanding of values. Only too frequently requisitions for tools and equipment are so loosely written that they can be filled with materials that are totally inadequate. There exist not only many makes but also diversified grades in most of the small and large tools required by the teacher for the use of his students in shop or laboratory. Yet there are at most but two or three of the grades that will be at all satisfactory under school-shop use. The teacher writing the requisition, therefore, must know exactly what he wants, and he must write his requisitions accordingly.

Then there is the matter of service. Is the manufacturer or dealer dependable and reliable? Will he be able, willing, and conscientious not in only filling the first order but also giving prompt service when that is required, so that the instructional procedure may not needlessly be interrupted because of faulty equipment tools, or supplies that did not measure up to specifications?

Buying according to price is not scientific or economic. There are many reliable dealers and manufacturers in the school-shop field. It is well to study their offerings first. In most cases, these firms have studied school-shop needs. Frequently they have spent appreciable sums of money in producing goods that will stand up under the conditions met with in instructional work. The descriptions of their wares appear in the advertising section of the shop teacher's professional magazines. These firms have worked hard to help the schools solve their problems. They assist the teachers of industrial arts and vocational education in financing many of their city, state, and national conventions. They deserve consideration, and requisition time furnishes an opportunity for showing them that their efforts are appreciated.

In your requisition worries, turn to the advertising pages of this magazine, for it is there that you will find the description of the wares that bona fide purveyors of school-shop equipment, tools, and materials offer to the industrial-arts and vocational-education field.

Popular Educational Advertisements

Advertising, like everything devised by human ingenuity, has its good and its bad features. Reading the many advertisements appearing in the popular magazines, on special training for certain occupations, would make one think that entrance into the various kinds of engineering jobs requires little more than taking a short course for a few months' time, and presto, one has been transformed into an expert whose services will be in great demand at a fabulous salary.

One of these much advertised courses is that of training Diesel-engine operatives and mechanics. Those who want to acquire a true picture of the training required by mechanics in this field of engineering, should not fail to read the article "The Truth About the Diesel Engine" written by one who is intimately acquainted with the practical and selling side of Diesel engines.

The frank and convincing statements made in this article by Max H. Schachner, Assistant General Sales Manager of the General Motors Sales Corporation, at Cleveland, Ohio,

will be helpful in steering the student's thinking into the right channels not only about the advertising on the training required for this particular kind of occupation, but also about other advertisements written in a similar strain about other phases of engineering pursuits that have been overpopularized.

Summer-School Attendance

Elsewhere in the pages of this magazine, the reader will find a number of announcements detailing the offerings of various summer schools. There are many men engaged in the fields of industrial arts and vocational education who, because of the lack of higher education, are definitely out of the race so far as future advancement is concerned. For these, summer school is a real necessity if they do not want to remain permanently in the lower salary brackets, or in the category of those who cannot be placed as teachers in junior or senior high schools.

To many of these men, the bugaboo of resuming serious technical study under men with whom they may not be acquainted, is as terrifying as it is to the boys who come into their own shops. This fear, largely imaginary, is seemingly an insurmountable obstacle. They will find, however, that attendance at summer school, while requiring hard work, is quite enjoyable in the main. The comradeship with others in the various classes is stimulating and helpful. The work in the classes, thought provoking as it is, may also do much to give the teacher-student new ideas on classroom procedure. Taken all in all, summer-school work is so worth while that it might well be looked upon as an excellent activity to be added to any vacation.

Of course, there are many teachers of industrial arts and vocational education who do not have to be sold on the value of attendance at summer school. It is really encouraging to observe how seriously so many of the industrial-arts teachers work at their professional improvement. Animated by this spirit, their success in the work to which they have dedicated their lives is unquestionably assured.

All our readers, therefore, are urged to read over the summer-school announcements now. It is quite possible to combine professional improvement with travel, camping, swimming, hiking, sightseeing, and other vacation activities. Planning and preparing ahead of time will insure best results. It is not too early, even now, in preparing vacation plans, including summer-school attendance.

That Fire Extinguisher

The fire extinguisher on the wall gives one a feeling of safety and assurance which may be far from being well founded. From all outward appearances that fire extinguisher may be ready for use — but is it? Is it subjected to periodic examinations to make sure that it is filled and ready for use? There will be no time for studying the mechanics of the device when instantaneous action is demanded to keep the flames from spreading.

Occasionally fire extinguishers are accidentally injured, probably even pierced. If this happens, it is best to return the extinguisher to the manufacturer rather than attempt to do the repair job at the school. The manufacturer is then able to decide whether it is safe to make the repair or whether it would be better to replace the extinguisher.

Then one must be careful, too, to use the fire extinguisher safely. The September, 1938, News Letter issued by the Power Press Section of the National Safety Council reports a case where a man was burned to death when he shot an extinguisher full force into burning gasoline and splashed the burning liquid on himself. It is not safe to use soda acid, water, or antifreeze-solution-type extinguishers on gasoline fires. As regards foam, vaporizing liquid, and loaded stream-type extinguishers, the safe and efficient way to attack flammable liquid fires with them is to discharge the stream against the farthermost wall of the container in which the liquid is burning, just above the burning surface, being sure *not* to direct the stream into the burning liquid. For carbon dioxide or dry-compound-type extinguishers, the application should also avoid agitation of the burning liquid, but in these cases the discharge should be applied first at the *near-by wall* of the container, sweeping the flame off the burning surface by gradually progressing forward, moving the discharge nozzle very slowly from side to side.

From the foregoing, it is readily seen that more is required than merely to have a fire extinguisher hanging on the wall. Know how to use the extinguisher provided. Instruct others in its use. Have it accessible. Inspect it periodically. Impress the student with its importance and allow no one to tamper with it at any time.

One of The Achievements of Our Age

On May 5, Texas University will dedicate the new McDonald Observatory and its huge 82-inch reflecting telescope. The Pyrex mirror of this telescope is 13 inches thick and weighs about 3 tons. It took four years of grinding and polishing to produce the curved surface which at its greatest depth of concavity is 1 1/3 inches. The curve was made accurate to one-millionth of an inch. After the grinding, the mirror was placed in an aluminizing cell from which the air could be evacuated. Then aluminum and chromium atoms were shot against the face of the mirror to form the reflecting surface.

The telescope is 26 feet in length and weighs approximately 75 tons, yet it is so carefully balanced that a 1/3-h.p. motor is all that is required to focus it accurately. Thirty motors are required to operate the entire observatory.

In an age when such miracles of accuracy and precision are performed, it would seem that it would take little persuasion to make the most obtuse layman see the necessity of introducing industrial arts and vocational education into every school system in the country. Yet, even the learned members of many of our institutions fail to see the necessity of giving the school child of today the training which it so vitally needs to fit it into its highly mechanized surroundings.

Instructors of industrial arts and vocational education are naturally interested in a project like this new observatory and its wonderful telescope. To them this marvel of mechanical perfection symbolizes the scientific advance of our age, and, at the same time, points out the need for giving our youth a training that will fit them to live in their mechanized environment.

This means that youth must not only learn to work with precision and accuracy, but also that the young must be equipped with the information that permits them, at least in a small measure, to understand the work of the men who utilize the products of this age, such as this telescope, in their study of the wonders of nature.

(Continued from page 191)

the left-hand column must be set separately to 5 picas. The next four columns are each 4 picas wide, while the extreme right-hand one is to equal 6 picas and 2 points in set length.

The depth of the job is uniform, John learns. Each horizontal rule is separated from its closest neighbor by 2 picas of spacing material. Whether this 2 picas is made up of metal furniture or 24-point quads rests on his judgment. In case of necessity, he appeals to the instructor, but students are encouraged to untangle their own problems insofar as they are able.

General shop practice calls for each job to begin and end with a nonpareil slug in order that tie-up and lockup are simplified. The B. E. line is always set in 6-point Century type so that it does not detract from the reading matter contained in the job.

When the job is set and tied up, John again refers to the *bible* to learn where shop affords. This fundamental instruction is given in the elementary portion of the lecture periods, and an index of all the type faces in the shop is posted in a conspicuous place to further simplify the procedure.

Since every type bears a number that also appears on the index line of type, the search for the proper type is brief. This index is set in single lines of the type which it names, to further simplify the task of proper and accurate distribution.

By working in the reverse order, John can take a job off the press, refer to its B. E. number, look it up in the *bible* and distribute every letter used in the proper cases.

The compilation of the B. E. book did not take an exorbitant amount of time, and its saving in daily instructional time is enormous. When any form undergoes a drastic change (one which cannot readily be indicated on the entry sheet), a copy of the job is printed on oversize card stock

ROOM TEMPERATURE CARD

	9:00	11:00	1:00	3:00	Gen. Ave.
Monday					
Tuesday					
Wednesday					
Thursday					
Friday 5	4	4	4	4	4-2/

DESCRIPTION

Set length 28 picas
Head type 10 Century
Body type** same
Type form* 15 x 28 picas
Okay by Superintendent
Stock size 5 x 5 inches

*This includes a slug at top and bottom of jobs one pica more than actual printing surface.

**The B. E. line is always set in 6 point century.

Fig. 1

CONDUCT RATING
JUNIOR HIGH SCHOOLS, ABERDEEN, S. D.

Name ..... Semester 19.....to 19.....

	1st. Six weeks	2nd. Six weeks	3rd. Six weeks	Remarks and Suggestions
Teachers name to go on vertical lines.		35		9
Initiative		2nd 7		
Industry and Perseverance				
Reliability				
Pupil Cooperation				
Economy of Time				
Courtesy				
Obedience				
Personal Neatness				

Key: 1-Superior 2-Satisfactory 3-Improvement needed 4-Very poor: visit from parent asked

Fig. 2. Front

CONDUCT RATING
JUNIOR HIGH SCHOOLS, ABERDEEN, S. D.

Name ..... Semester 19.....to 19.....

	1st. Six weeks	Summary	2nd. Six weeks	Summary	3rd. Six weeks	Summary	Remarks and Suggestions
Teachers name to go on vertical lines.							
Initiative							
Industry and Perseverance							
Reliability							
Pupil Cooperation							
Economy of Time							
Courtesy							
Obedience							
Personal Neatness							

Key: 1-Superior 2-Satisfactory 3-Improvement needed 4-Very poor: visit from parent asked

Fig. 3

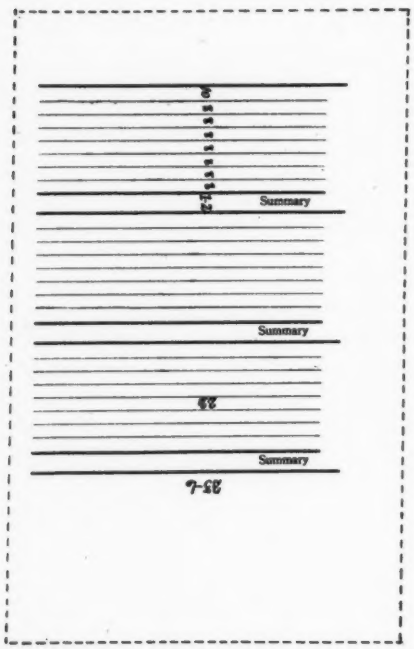


Fig. 2. Back

the proof is to be taken for O.K. When this O.K. is secured, it is brought to the instructor, who then makes any minor corrections necessary and designates the press for which the job is to be locked.

At the same time, he writes an order for stock of the right kind and specifications, and assigns another student to the job of cutting it.

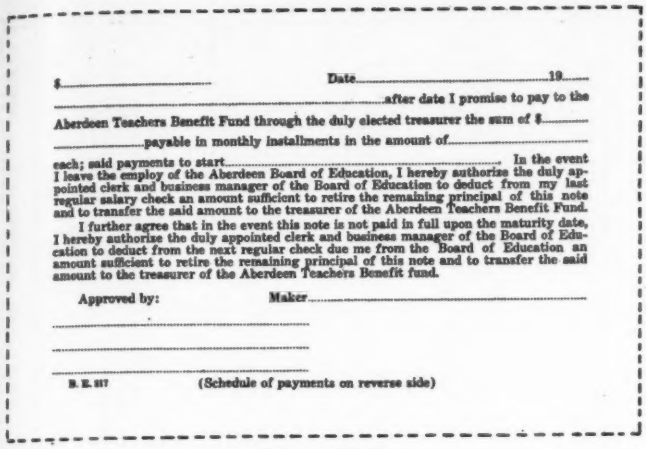
After the job is locked, it is carefully positioned on the press, a position and ink O.K. secured from the instructor, and then the job is run through the press in short order. The major purpose of this final O.K. is to prevent John from wasting stock while running it with inaccurately set gauge pins, or with ink that is too gray. The final O.K. sheet also bears the penciled notation as to how many are to be run through the press. The O.K'd sheet, kept on the delivery board of the press, serves as a guide for ink color throughout the press run.

This description outlines the path of the ideal job as it goes through the shop. It presupposes John's knowledge of where various types are to be found, and his familiarity with the three rule faces the and this is completely filled out and pasted over the old form. In this manner, the B. E. page containing it need not be completely reworked, particularly if it contains another entry form.

Forms which call for two or more runs on each side of the sheet (Fig. 2) show the individual forms separated and printed so on different portions of the B. E. sheet. This makes it easy for the compositor to visualize how each form is to look, and eliminates laborious computations. On another page of the B. E. book appears the imprint of the two forms (Fig. 3) correctly registered on each other. Front and back forms (Fig. 4) appear on the same page of the B. E. book.

Such a robot system of instruction gives the printing teacher much additional time to spend on jobs which are in the shop for the first time, and provides for systematized fundamental instruction against the time when the students will be past the "sink or swim" stage, and on their own.

This system is not foolproof; no system is. But it provides that time element which makes it possible to give individual instruction to a much greater number of



$..... Date.....19.....

.....after date I promise to pay to the Aberdeen Teachers Benefit Fund through the duly elected treasurer the sum of $.....

.....payable in monthly installments in the amount of..... each; said payments to start..... In the event I leave the employ of the Aberdeen Board of Education, I hereby authorize the duly appointed clerk and business manager of the Board of Education to deduct from my last regular salary check an amount sufficient to retire the remaining principal of this note and to transfer the said amount to the treasurer of the Aberdeen Teachers Benefit Fund.

I further agree that in the event this note is not paid in full upon the maturity date, I hereby authorize the duly appointed clerk and business manager of the Board of Education to deduct from the next regular check due me from the Board of Education an amount sufficient to retire the remaining principal of this note and to transfer the said amount to the treasurer of the Aberdeen Teachers Benefit fund.

Approved by: Maker.....

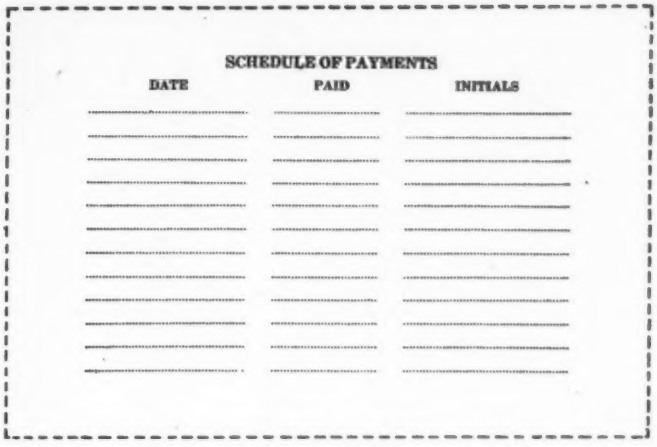
.....

.....

.....

B. E. 317 (Schedule of payments on reverse side)

Fig. 4. Front



SCHEDULE OF PAYMENTS

DATE	PAID	INITIALS

Fig. 4. Back

students and keep a steady check on the working speed of every student in the shop.

Ordinarily a student is given no more than a week in which to turn in an official O.K. on a job assigned him. If the O.K. is not forthcoming in that length of time, a checkup usually reveals why it is not progressing satisfactorily.

If the job proves to be beyond the student, it gives the instructor a chance to make adjustments. If, on the other hand, the student is merely loafing, it provides an opportunity for correcting such a condition.

Industrial-Arts Integration

Harvey E. Parry

Manual Training High School, Brooklyn, New York

Taking the broad view of the word "integration" as it applies to the education of the entire person.

To the teacher, the term *mechanical age* should bring more to mind than mechanical progress and the ever-increasing complexity of the modern world. It should emphasize the fact that children in the classroom are but one very short step from the center of this activity. Some of the students of today are destined to be producers in this world of wheels, gears, and cams; all will be consumers of the products of industry. Industrial-arts education, recognizing the need of the former for specialized training in the mechanical fields, is helping to bridge the gap between school and industry. But, unfortunately, there has been a tendency to set the trade subjects apart from what are usually termed cultural courses; trade teachers and academic teachers are too often poles apart in their estimation of what is needed to turn a youngster into a worth-while adult citizen. That he should acquire some skill in whatever shop activities he elects, is generally accepted; that he should have an understanding of the technical work related to those activities is likewise appreciated. There are, however, sharp differences of opinion concerning the academic subjects that are necessary to round out the education of the industrial-arts student. But what these should be, their number and their scope, is not the subject of the present article; it deals, rather, with a suggested approach toward their integration with shop activities and moral traits so as to produce maximum enrichment of the student's educational program.

In this connection *integration* must not be confused with *correlation.* Educationally, the latter has to do with bringing about a mutual relationship between two or more subjects: shop students, for instance, do the woodwork incident to a project in history. Integration, on the other hand, is concerned with *rendering entire and complete* a student's educational experience. In other words, each subject which he studies is brought into intimate relation with every other subject, the whole being definitely connected with the place he will be best fitted to occupy as an adult citizen. In an industrial-arts program such an objective involves a far closer connection between shop activities and academic subjects than usually exists. It is of little avail to give a student in the general-metal shop, who intends to earn his living at the trade, a stereotyped course in medieval history. Such a course would be too far afield to arouse any permanent interest. But medieval history with the emphasis placed on the part played by metal and the artisans in metal would call forth a far different response. A student of ceramics whose commercial geography deals, for instance, with the pottery centers of the world and whose English themes deal with some of the fascinating phases of the potter's art is integrating his hand skill with his *book knowledge.*

But, protests the academic teacher, consider the difficulties involved in such a teaching program! Difficulties indeed, but not insurmountable. The first requisite for success is a change in point of view. No longer must the industrial-arts student be considered a person apart, a mere mechanic in the making, whose interest in cultural matters is necessarily of the slightest. Something of the Danish educator's viewpoint, as it finds expression in the folk high schools, must be acquired:

"We cannot," said Bishop Grundtvig, the founder and guiding spirit of the Danish folk high-school system, "get anywhere if education is organized as if everyone were to be an official or a gentleman of leisure. In that case the entire people will die of hunger . . . but no matter how humble the life work of a student is to be, we must educate also toward idealism."

The mechanic, whatever his field, is one of a large and highly important group of society, and as such he is entitled to training that will make him an all-round effective citizen — not a mere wielder of tools. But to give him that broadening training, the academic teacher must have an understanding of the problems incident to his way of life. For maximum results, the teacher ought himself to become skillful in one or more of the mechanical fields. A middle-aged woman taking a summer

CONTENT ENRICHMENT OF CURRICULUM THROUGH INDUSTRIAL ARTS INTEGRATION

Seventh Grade	ARITHMETIC	ENGLISH	GEOGRAPHY	HEALTH	HISTORY	READING	SCIENCE	WRITING	ART	SHOP ACTIVITIES General Woodwork	SHOP ACTIVITIES Comprehensive General shop
MORALS	Early study of parts of whole unit 12-in. rule	Learn to look up material references (elementary research)	Make relief maps	Proper muscular and mental activity produce excellent work	Trace growth of shop activities through the ages	Use goodly share of industrial topics in reading assignments	Scientific basis of manual operations	Practice for legibility and accuracy	Art principles should underly all craftwork	Use of tools Hammer Square Saw	Gain skill in use of tools of industry
FOODS	Utilization of packing-box materials. Purchase of foods in pounds and fractions thereof	Read about wood used in foods and medicines	Many trees supply us with both food and lumber	Shopwork develops worthy appetites	Trace connection between industry and food preservation, e.g., bins, boxes, tin cans, rat-proofing, etc.	Use material on food sources and transportation to show importance of wood and metal in supply-world larder	Application of science and industry in preservation of food	Write out proper menus for shop workers	Draw wooden food containers such as baskets and boxes	Use of tools Chisel Plane Gauge	Elementary work in Carpentry Patternmaking Cabinetmaking
PLAY AND RECREATION	Making pucks, Games involving whole and part units	Write compositions about personally made games	Make and study games of other communities	Stress the health secured through making one's own playthings	Trace improvements in games due to industrial practices of modern world	Fun in craft hobbies	Fun in making scientific things	Write about games made in the shop	Handmade games of long ago as found in pictures	Layout work Marking with knife	Elementary work in Wood finishing Household mechanics projects
CLOTHING	Make simple looms. Cutting material into parts of yards	Discussions on looms and weaving	Use of wood in clothing	Proper dress for workmen	Handmade vs. machine made clothing	Read safety articles dealing with well-designed shop clothing	New developments in use of wood in clothing: rayon	Write story about shop clothing	Pictures showing use of wood and metals in clothing	Saw Straighten with plane	Simple problems in electricity Lighting Heating Power generation
SOCIAL RELATIONS	Advantages in giving part of one's time to others	People must live together in homes built by mechanics	Universal use of wood. Introduction of metals	Aid fellow workers in pursuit of health	Distinctive dress formerly worn by different craftsmen set them apart in the community	Teach that the boy or girl skilled in handwork is a valuable member of community	Industry and science are partners	Prepare paper on how to get along with fellow workers	Artistic surroundings make for more pleasant home and community life	Assemble small projects such as toys, games, etc.	Simple problems in electricity Power transmission Use of power
BODY CLEANLINESS	Disadvantages of half washed hands, half-brushed hair, etc., leading to half-finished jobs	Read about the results of bodily neglect	Universal enjoyment of things made by clean workmen	Develop cleanliness needs of shop workers	Growth of bodily-cleanliness idea for artisans as well as for persons of wealth and position	Instill idea that even "dirty work" mechanics can be clean in leisure hours	Soaps and cleansers are the results of scientific study	Write letter describing cleanliness facilities in school shop	There is beauty in a clean body, a clean house, a clean shop	Repair small breaks in furniture, toys, etc.	Simple problems in general metal Soft metal casting Forge work
RELIGION	"Golden Rule"	Many respected, God-fearing men through the ages were artisans	The first church was doubtless a grove of trees	"Sound mind in a sound body"--ancient religious belief	Early craftsmen made a religion of doing perfect work	Read the famous poem "Trees." Part played by trees in ancient religions	Science and craftsmanship require serious thinking	Religious writings on papyrus	Study the part of woodworkers, etc., in the construction of ancient temples	Make cellar screen	Simple problems in general metal Tempering Sheet metal Art metal
SELF-RELIANCE	Make play money to be used in classroom for making change, etc.	Stress ingenuity and "go-gettership"	Workers in wood have a means of livelihood world over	Skilled workers have a confidence in themselves that promotes mental health	The apprenticeship system of the guilds developed self-reliant workmen	Pioneer literature	Experimentation leads to new discoveries in ways of doing work	Describe ways in which the shop pupil can be self-reliant	Teach ingenuity in working out designs	Paint small objects	Leather work Jewelry Photography
THRIFT	Make penny bank	Drill on economy: time, space, material, etc.	Don't waste wood products. A tree takes many years to grow	Economy of health protects the human machine	Thrifty artisans who expanded their business often became powerful factors in economic life. Examples	It is often cheaper to make than to buy	Scientific procedure encourages thrift	Write about the different kinds of thrift: money, material, time, etc.	Inexpensive projects can be artistic	Building hardware	Ceramics Analysis of clay Preparation of clay Forming of utensils
HONESTY	The dishonest workman cheats himself most	Read honesty theme stories	Honest measurements aid good shopwork	False health practices destroy both mind and body	An honest job, well done for its own sake, used to be a matter of pride to a workman	"Honesty is the best policy" as applied to workmen who became famous	Science admits of no dishonesty	In what way is the disorderly shop pupil dishonest?	There's no pleasure or value in copying another's design	Kinds of woods Growth Cutting Seasoning Shrinkage	Textiles Raw materials Knitting Weaving Design Dyeing
CONTENTMENT	SHELTER	OBEDIENCE	HOPEFULNESS	CHEERFULNESS	FEAR	CAUTION	TRUTHFULNESS	LOYALTY	PURITY	HELPFULNESS	HEROISM

CONTENT ENRICHMENT OF CURRICULUM THROUGH INDUSTRIAL ARTS INTEGRATION

CONTENT-MENT	SHELTER	OBEDIENCE	HOPEFULNESS	CHEERFULNESS	FEAR	CAUTION	TRUTHFULNESS	LOYALTY	PURITY	HELPFULNESS	HEROISM

CONTENT ENRICHMENT OF CURRICULUM THROUGH INDUSTRIAL ARTS INTEGRATION

Eighth Grade	ARITHMETIC	ENGLISH	GEOGRAPHY	HEALTH	HISTORY	READING	SCIENCE	WRITING	ART	SHOP ACTIVITIES Printing Bookbinding	SHOP ACTIVITIES General Metal
MORALS	Science of numbers is an essential part of trades such as metal-work, printing, book-binding	Ability to use effec-tive English an asset to plumber or banker	Printing, metalwork and bookbinding are trades that are at home all over the world	Good health is a basic requirement in any sphere of effec-tive work	History of industrial development far more important to welfare of mankind than his-tory of wars	Purposeful reading should enrich the pupil's educational background	The science "why" underlying shop activities should be an integral part of the curriculum	Printing, which is nothing but writing by machine, dis-seminates the wisdom of the ages	Design and repre-sentation were the earliest written language	Printing Composition Pulling proofs Proofreading	Simple soft metal casting Single draft Green core Split pattern
FOODS	Old printed cookbooks give old ways of measuring foods	Preservation of foods in metal con-tainers is a topic worth reading and writing about	Food containers of other countries	Menus to promote vibrant health in shop workers	The printed word in book form has brought story of foods down to present day	Cookbooks, old and new	Books on the science of foods are in-creasing knowledge of proper feeding of the human body	The width of food choice increases with printed adver-tising	The ornamentation of metal food con-tainers attracts new buyers	Composition Distribution Layout	Forge work Welding Brazing
PLAY AND RECREA-TION	Number games using metal counters	A classroom news-paper encourages use of correct English	Use of metal toys and playground equipment in U. S. and other countries	"All work and no play makes Jack a dull boy" in shop and classroom alike	There is an important historical connection between a child's toy typewriter and Guten-berg's first printing press	Leisure-time activ-ities can include hobbies such as print-ing, bookbinding, art metalwork	Scientific toys encourage early interest in artis-anship	Writing games are instructive and entertaining	Bookbinding can be an art hobby that also pays good dividends	Imposition (stone work) Page layout Place furniture	Tempering Annealing Hardening Drawing
CLOTHING	Cost of clothing ornaments such as metal buttons, belts, buckles, etc. Cost of needles, thimbles, etc.	Metal clothing: the fascinating history of armor	Shop clothing in dif-ferent parts of the world	Proper shop clothing promotes health as well as safety	Illustrations in old books often important in depicting costume of the day	Books on costume, old and new	A possible future use for old magazines and books: paper clothing	Fashion write-ups give clothing styles a universal character	Metal ornaments on clothing can be art-istic as well as useful	Imposition Planing type Lock up chase Test	Sheet metal Drafting Seams Lock Butt Rivet Soldering
SOCIAL RELA-TIONS	Metal currency has long played important part in intercourse of peoples	Knowledge of trade terms promotes better understanding: "We speak the same lan-guage."	Printers, metalwork-ers and bookbinders of all countries have much in common	Sickly workers dis-organize a shop and cause extra work to fall on the others	The trade guilds of the middle ages played vital parts in community life	Discussion clubs on books read create com-munity of interests among pupils	Annual Children's Science Fair of the Museum of Natural History	Writing and the printed page make the whole world neighbors	Artists, in the fine arts or indus-trial field, have much in common	Press work Place form Ink press Check grippers	Art metal Etching Piercing Expanding Annealing
BODY CLEAN-LINESS	Need for body clean-liness is one reason why plumbing is essen-tial despite its cost	B.O. and good English do not go together even in a master mechanic	Many countries have governmental regula-tions to enforce cleanliness in industry	In classroom or shop one likes to work beside a companion who is clean in body and habits	The history of plumb-ing is the history of the search for clean-liness and sanitation	Read government pam-phlets on hygienic regulations in fac-tories	Printed advertising, books, and pamphlets, disseminate hygienic principles	Printing has made widespread the need for personal clean-liness	Art books stress the body beautiful; cleanliness is one of its attributes	Press work Gauge pins Care of press Feed Oil machine	Ornamental iron work Brazing Riveting Forming
SELF-RESPECT	Installation of modern plumbing in home justifies its cost in increased self-respect of occupants	"I used to think he was a fool; when he opened his mouth to speak, he removed all doubt f"	A country's attitude toward its indus-tries affects the self-respect of the workers	A mechanic's strong, well-muscled body commands the respect of others and in-creases his own.	There is nothing menial about skilled handwork. Artisans have always been respected citizens	Story of Benjamin Franklin, the self-respecting printer who won the respect of the world	Possession of a scien-tific background en-hances the self-respect of ambitious mechanics	A person's respect for himself is evi-dent even in such small matters as the writing of shop notes	The love of beauti-ful things creates craftsmanship	Bookbinding Preparing Sewing Pulling Repairing	Plumbing Cutting pipe Threading Minor repairs Removal of stoppages Building code
SELF-RELIANCE	Ability to calculate rapidly and accurate-ly makes a mechanic less dependent on fellow workers	Self-reliance of itinerant mechanics (tinkers) of colonial times. Stories, themes	The apprentice system of foreign countries develops self-reliant mechanics	Health creates a spirit of self-reli-ance in tackling jobs requiring strength	Without inventors who relied in their abilities, there would be no history of industry	Reading about self-reliant workers is only the initial step in developing personal self-reli-ance	Knowing why things take place increases a worker's self-reli-ance in handling tools and machinery	Written directions are accurate, but the self-reliant worker can carry messages in his head as well	Skilled craftsmen create beauty that enhances a country's prestige	Assembling Making end papers Sewing Sewing	Air conditioning History of New methods Future
PATRI-OTISM	Cost of Statue of Liberty (bronze) was born by French people as patriotic gesture to U. S.	Reading about the early founders of our industries promotes patriotic feeling	"Foreign" mechanics are not necessarily dumbbells	Healthy skilled citizens are a country's greatest asset	Many of the early American patriots were artisans; Paul Revere, Benjamin Franklin, etc.	The manufacture of metal nails was a cause of the Amer-ican Revolution	The worker who im-proves the commun-ity's industrial life is doing a high patriotic duty	Writing words for a patriotic song	The craftsman who can make beautiful things has a ready means of livelihood	Forwarding Pasting up Gluing up Finishing	Machine shop Hand tools Machine operation Drafting
COURTESY	Courtesy pays divi-dends in any business	Courteous speech is an asset to the youngest "printer's devil"	Courtesy includes respect for methods of work different from one's own	Shop courtesy in-cludes consideration for the well-being of fellow workers	Any history will prove that courtesy isn't the monopoly of kings	Reading about cour-tesy isn't enough; it must be practiced daily in classroom and shop	Due acknowledgment of another's inven-tion or discovery is the height of pro-fessional courtesy	Courtesy may be shown to advantage in the business com-munications of a shop	Artists in any field respect the work and views of other artists	Stamping Gilding Glair Embossing	Auto mechanics Tire repairs Body bruise removals Touch-up work Gas and water checkups
TEMPER-ANCE	COURAGE	PERSEVERANCE	FIDELITY	HEROISM	SOCIAL	COWARDICE	TOLERANCE	FOOLHARDINESS	DARING	SYMPATHY	COMRADESHIP

CONTENT ENRICHMENT OF CURRICULUM THROUGH INDUSTRIAL ARTS INTEGRATION

Ninth Grade	MATHEMATICS	ENGLISH	COM. GEOGRAPHY	HEALTH	HISTORY	LANGUAGE	SCIENCE	ART	SHOP ACTIVITIES General Electricity	SHOP ACTIVITIES Textiles	SHOP ACTIVITIES Ceramics
MORALS	Increased mathematical accomplishments make for shrewder business	Continue definite research practice to promote skill in finding information	Study pottery centers of the world	Work as a play fellow usually brings contentment, mental and physical	Throughout the ages, workers of the better grades have won honors	Study trade terms for a better understanding of trade language	Forethought, perseverance, and skill in all fields has made the development of science what it is	Even the most commonplace of trade operations can be based on sound art principles	Simple cells Dry cell Storage cell Nickel cell (Edison)	Fabrics Wool Cotton Silk Hemp Linen	Clay Types of clay Geographical distribution
FOODS	Economy of mathematically packed food products	Study use of electricity, textiles and ceramics in preparation and preservation of foods	Consider how foods are shipped (containers) from various countries	Proper food for active workers	The history of pottery is closely bound up with the history of foods	Food a frequent motif in early pottery and textiles: Egypt, Greece, Rome	Science and industry go hand in hand in food production and distribution	Artistic tin cans and glass food containers? Of course! They're good psychology	Bell circuits Single Double Two-way	Tapestries and rugs Historical study Materials Technique	Clay Analysis Preparation for potter's use
PLAY AND RECREATION	Calculate dimensions of vessels of given content made in ceramic classes	Read the lives of promoters of trades	The importance of fabric in the toys of the world	Work seen in a proper light becomes a hobby, a puzzle, fun	Early play employed natural things; industry produces most games today	Play, fun, and laughter the best international language	Electric toys built on scientific principles are interesting and instructive	Beauty in practical things is a modern demand	Splices Western Union Long Short Running Soldering	Pressing Effect of heat on fabrics Dampening Ironing Steam pressing	Types of pottery Common China Porcelain
CLOTHING	Cost of electrically made clothing vs. handwork	The story of historic costume as found in famous tapestries and vase designs	Compare clothing materials and styles in various latitudes	Proper clothes for active workers	The history of costume cannot be separated from the development of textiles	Art and color in clothing speak for a people and their habits	Scientific thinking has evolved practical clothing from many new materials	Clothing made of glass is not a fantastic idea. It is the subject of modern experiments	Minor repairs Connections Electric iron Vacuum cleaner Toaster	Raw materials Growth Preparation Spinning into thread	Forming of utensils Coil method Sweeping
SOCIAL RELATIONS	The increasing cost of neighborliness	Modern methods of communication have placed the world in immediate conversation	How do the products of industry bring the parts of the world closer?	A proper attitude respecting the opposite sex is essential in a shop. The vulgarity of smutty talk	Making of clothing and pottery formerly a household affair; now the basis of vast industries	Language, as well as mechanical advance helps us to get along with our neighbors	Better communication through science has promoted better understanding between trade groups	Art in industry is unifying in thought and practice	Electric meter Read meter Calculate bills	Textile design Study historical design Make simple textile designs	Forming of utensils Casting Potter's wheel
BODY CLEANLINESS	The prevention of sickness is a mathematical proof of the need for cleanliness	Increasing literacy promotes interest in cleanliness	Compare bodily cleanliness due to clothing materials the world over	How to avoid B.O.--theme contest	Perfume covered bad smells in old days. Today extra clothes provide clean changes	Clean shop language Clean personal appearance Clean jobs	Science has taught us, first, to be clean, then how to be	Beauty in cleansing agents is a further incentive to cleanliness	Magnetism Simple magnets Theory Uses	Textile cleaning Washing Chemical cleaning Effects on fabric and color	Glazes Types Uses Application
INDUSTRY	The industry of mathematicians and electricians has brought about present success	Electricity has so speeded up progress that one must be active or be forgotten	In warm countries where needs are few and easily supplied, industry is least progressive	The industry of the spider in weaving its web	"When Adam delved and Eve span, Who was then the gentleman?"	Application is needed alike in good speech and mechanical proficiency	The whine of a busy motor reminds us of the active bee	Practical artists in the trades are no dreamers; they are industrious workers who command fine salaries	Telegraph circuits Simple Keys Transmitters and receivers Pony relays	Utilization of handmade textiles in simple garments	Firing Need for Methods
SELF-RELIANCE	The self-reliance of Morse, et al, has added much to the wealth and happiness of the world	Stress originality; in story plots and in mechanical equipment leading go new practices	Energetic peoples produce many things, among them, self-sufficiency	Health promotes self-reliance	The early traders of history showed great self-reliance. Trade routes to the East	Ability to speak a dozen languages is no substitute for self-reliant behavior	Knowledge of the scientific principles behind shop operations enhances self-reliance	Temperament may be alright in other art fields; it has no place in industrial art	Lighting Simple lighting circuits Switches Base outlets	Cloth making History of weaving Simple looms Advanced weaving	Ceramic design Historical study Fundamental principles Surface design application
SELF-CONTROL	Those who lack self-control cannot accomplish much within mathematics or in a trade	Self-control and concentration are important in any trade field	Constant application brings success, which develops self-control	Refraining from foolish practices in electrical work may spell the difference between life and death	Leaders of history first controlled themselves, then others	Swearing in any language is vulgar and shows lack of self-control	The laws of science set up their own regulations	Art, like science, has a set of controls and requirements	Motors and generators Fundamentals Construct simple motor and generators	Dyeing Types of dyes Effect on materials Color combinations	Glass Materials Methods Flat glass Glass blowing
TRUSTWORTHINESS	Mathematics and industry depend alike on dependability	Lack of trustworthiness makes one always a follower, never a leader	People who are producers do not need trickery to succeed	The teacher choosing a pupil for an important errand doesn't pick a scatterbrain	History and machines alike exalt trustworthiness	Accuracy in speech and work develops trustworthiness	An electric motor that can be depended upon is a treasure; so is a trustworthy individual	A trustworthy practical artist must know the basic principles underlying trade operations	Radio Wire simple sets Trouble shooting	Textile repair Mending Reweaving	Ornamental glass work Historical study
DETERMINATION	PATIENCE	AMBITION	CHIVALRY	CONSECRATION	ETHICS	JUSTICE	REVERENCE	FORTITUDE	FRIENDSHIP	COOPERATION	KINDNESS

course in sheet metal at New York University (begun, apparently, with reluctance) remarked enthusiastically somewhat later in the term: "Why, I had no idea this kind of work could be so fascinating—or so difficult . . . !"

This reaction is not unusual. Certainly the teacher went back to her academic teaching with a new light on the problems of her industrial-arts students; she had begun *to speak their language.*

The burden of integration must not fall wholly upon the academic teacher. The shop instructor needs to develop a keener appreciation of the value of academic subjects in the industrial-arts curriculum. As a rule he is better equipped with respect to such understanding than is the academic teacher with respect to shop subjects because supervisors of trade curriculums have long been insisting upon certain academic requirements as part of a shop instructor's educational equipment, even when he comes to teaching directly from the trade.

The value of this two-way integration between academic subjects and shop activities can hardly be overestimated, but highly desirable as it is, it needs still a third aspect, actively promoted by both academic and shop instructors, to make it complete. This has to do with the matter of morals, without whose animating spirit both hand skill and book knowledge are Dead Sea fruit. Here we run full into one of the newer conceptions of the role of the modern school in the life of the child, that of an agency for educating the *whole* child in a rapidly changing civilization, not merely a supplementary institution chiefly intellectual in character. Says Dewey:

"Morals concern nothing less than the whole character. . . . To possess virtue does not signify to have cultivated a few nameable and exclusive traits; it means to be fully and adequately what one is capable of becoming through association with others in all the offices of life. . . . The moral and the social function are, in the last analysis, identical with each other. To fulfill its social function, education must be animated by a social spirit, and the great danger which threatens school work is the absence of conditions which make possible a permeating social spirit. This is the great enemy of effective moral training. A narrow and moralistic view of morals is responsible for the failure to recognize that all the aims and values which are desirable in education are themselves moral. Discipline, culture, social efficiency, personal refinement are moral traits which it is the business of education to further. . . . Unless the learning which accrues in the regular course of study affects character, it is futile to conceive the moral end as the unifying and culminating end of education. When there is no intimate organic connection between the methods and materials of knowledge and moral growth, knowelge is not integrated into the usual springs of action and the outlook on life, while morals become moralistic. . . ."

The accompanying charts [illegible] suggested approach to the matter of integrating desirable moral traits with both shop activities and academic training. They are by no means intended to be either lesson plans or courses of study. There is no intention, moreover, to preach; no sentimental goody-goody program, nor any overemphasis on conventions and traditions. It is hoped, rather, that the suggestions will set the instructor's imagination to working, that they will open up new possibilities in this business of hitching specific educational information with those less tangible but eminently necessary qualities known as moral traits.

Radio Programs for Industrial Arts

Clifford K. Lush

Industrial-Arts Assistant,
Public Schools,
Minneapolis, Minnesota

Two fifteen-minute programs, the first consisting of two skits, and the second of one playlet.

The following radio skits were presented over a local broadcasting station in an attempt to interpret the modern philosophy of industrial arts in the junior and senior high schools to the listening public.

These features constituted the material for two fifteen-minute programs, along with music by a school orchestra. The broadcast procedure for the program depicting senior-high-school industrial-arts objectives was as follows:

Announcement of the feature, the objective, the sponsor, the school represented, and setting of the first skit	2	min.
Skit No. 1	3	min.
Music by orchestra	10	sec.
Closing remark concerning Skit No. 1 and setting for Skit No. 2	20	sec.
Skit No. 2	3½	min.
Closing remarks about Skit No. 2, announcement of musical organization represented and title of their first number	30	sec.
Music	5	min.
Closing remarks by announcer	30	sec.

The programs were given during the early afternoon, and consequently an attempt was made to make them of interest to women in the home, who undoubtedly were the largest body of listeners at that time.

Radio Program No. 1

Announcer:

The public-school radio program for today will be a brief interpretation of the high-school industrial-arts education in the public schools wherein more than 40 per cent of the boys in the Minneapolis high schools are enrolled in this type of "learning by doing."

For years woodworking and mechanical drawing have been offered to boys under the name of *manual training*. The term *industrial arts* includes these two subjects as well as the courses of architectural drawing, machine shop, auto mechanics, forge, patternmaking, printing, and the like.

More than three of every ten men in Minneapolis work at some mechanical or manufacturing occupation. Added to these are men who work in the field of transportation and communication. Minneapolis is also a great commercial center, especially in the distribution or sale of industrial products wherein the knowledge of manufacturing processes is of vital concern for intelligent salesmanship.

With several thousand different types of occupations at which men may work to earn a living, how is the boy to learn about all these so that he may attempt to begin training for entrance into the one in which he will find the greatest happiness and likelihood for success?

One of the primary purposes of industrial arts in the public schools is to give this guidance information, as well as to guide the student in developing appreciations and respect for the other fellow's job. Think, too, how much richer we are when we understand how the commonplace articles of everyday life are manufactured, or kept in repair. A great deal of this information and experience is furnished by the industrial-arts classes in the junior high school in such general courses as woodworking, metalworking, mechanical drawing, electricity, and printing. Advanced machine work and courses which require more physical maturity are left for the high school. Let us see how some of this training functions.

The scene is in the basement of Mr. John Harold's home where he and his son are building a workshop during the evening. (*Noise of hammering.*) The son, Bob, speaks.

BOB: Now, Dad, we have our workbench built. Pretty nice, eh?

MR. H.: Oh, not bad.

BOB: I'm going to put up some nails and hooks on this panel for the tools. You showed such terrific skill with that saw, why don't you rip a piece off that board for a shelf for the paint cans?

MR. H.: You certainly set me at the important tasks. Who's the boss around here, anyhow?

MOTHER: Here I am. Are you two pests going to spend your lives down in this basement?

BOB: You'd better skip back upstairs. This is only a place for men anyhow. It serves you right for giving me all these tools for Christmas. Boy, isn't that lathe a honey?

MR. H.: Yes, you'll have to take the blame again, Mother, dear. You know you promoted this idea for tools to keep Bob at home evenings. Now we're both pests, are we?

MOTHER: I can probably forgive you if you make all the things you promised, and by the way, you may try that plane on the back door. It sticks all the time, and the lock is hard to close.

MR [illegible]: Oh, all right. I guess you still wear the c[illegible]f dictator around here. Give me that [illegible]son.

BOB [illegible]NO, you don't need to plane it; you just push up the two pins in the hinge and remove a little more wood under the top hinge on the door with a chisel. That will lift the door back so that the lock will catch and the door will pass by the jamb.

MR. H.: Well, where did you learn that?

BOB: In school, and I also learned in architectural drawing that we can make this basement warmer if we pack some rock-wool batting along the top of the foundation there.

MOTHER: That sounds pretty good to me. John, you'd better let Bob do all those things. I'm afraid to have you try it.

MR. H.: Yeah — I get less and less important around here. All I'm good for, I guess, is bringing in the monthly check. But say! Mother don't you see the old man is learning from the boy. That's a grand feeling to realize that I'm not too old to learn.

(*Music by orchestra — ten seconds.*)

Announcer:

Such home workshops for boys are certainly to be encouraged. Suppose we listen to a conversation between the foreman in a factory and a boy worker. Mr. Brown, the foreman, has called the boy employee in an office out of the noise and confusion of the factory.

(*Factory sound effects — buzzing machines, stamping machines, belt clicks.*)

FOREMAN: Come in, Tom, close the door. (*Door slams, noise stops.*)

TOM: Did you send for me, Mr. Brown?

FOREMAN: Yes, Tom, I did. To get to the point, that fin press which you are feeding is about worn out. We're replacing it with an automatic-feed type which requires only one person to operate it. Bob has been here longer than you, so I'm afraid we'll have to let you go.

TOM: Yes sir. (*Dejectedly.*) That means my job, but I've been expecting it. (*Pause.*) D'you mind telling me how that new press works?

FOREMAN: Well, Tom, if you're interested, under the circumstances. There's an electric eye, photoelectric cell, they call it, which closes a relay to control a shear. This cuts off the required length sheet of zinc, which is in a large roll, rather than having single sheets fed in by hand — the work you've been doing. All Bob will have to do is to keep it adjusted, put on a new roll, and take the finished fins over to the assembly line to be made into the radiators.

TOM: I'd like to see that work, all right. (*Pause.*) Isn't there an opening somewhere else around the factory? Gosh — I've got to have work. I'll do anything if you'd give me a chance.

FOREMAN: You've done very well for a boy just out of high school. But what experience have you had? What else can you do?

TOM: Well — just what I got in school. I've had some welding and machine-shop courses and also some woodworking, but no factory experience.

(*Door opens, noise increases, then fades.*)

FOREMAN: Oh, hello, Mr. Jones, I just took over your office here to get out of the noise. Here's your chair.

JONES: No, sit still, I just wanted to get this record book. What's wrong?

FOREMAN: Nothing. That new stamping fin press will be installed tonight. That lets this man out. You remember Tom, Mr. Jones?

JONES (*Talks fast and businesslike*): Tough for you son, but you're young. (*Starts to leave — door opens.*)

TOM: Mr. Jones, you — ah —

FOREMAN: Tom says he has had some machine-shop work. Can you make a place for him?

JONES: Well — (*thinking*). Push that second button — no, there. The orders are coming in pretty well — (*slowly, as if thinking*). This new machinery is going to cut costs and we expect more business with the new prices. Therefore, production will be stepped up somewhat. We need a good diemaker, but that takes a good man.

(*Door opens again — enter Mr. Olson.*)

MR. OLSON: Did you buzz me, Mr. Brune? Oh — ah — excuse me, Mr. Jones. Ah — I didn't see you.

MR. JONES: Ole, can you use another rookie?

OLSON: Vell, eh vant a good diemaker, but eh guess eh can't get him. Who you got?

JONES: I remember your saying that the young fellow you took a couple of years ago is getting good. If you want another boy to train, talk it over with Brown there.

TOM: Okay, Mr. Olson, I know I can do it. Just let me try it.

OLSON: Okay, eh gif you a shance.

(*Exit — door opens, then closes.*)

Announcer:

And so Tom became a helper in the machine shop, because of his having taken several shop courses in high school. Varied experiences enrich the possibilities for employment, as technological changes take place. Of course, Tom will need to go to evening school in order to become proficient in his new work, but he has the possibility of working his way up, and a chance at being the boss some day. They all started at the bottom.

(*Music.*)

Radio Program No. 2

Program Sequence:

Music by band (*theme song*) to continue for 15 seconds and, if possible, to continue as background music to beginning of play.

Announcer:

Ladies and gentlemen, we are about to present a short play entitled *The Last Word,* prepared by the department of industrial arts.

The industrial subjects are offered to students from the seventh grade through the senior high school to acquaint young people with the vast field of industry; to furnish opportunities for self-expression in handwork and machine operation; to develop appreciations; to impart information useful to them as future consumers; to acquaint them with the mechanical and scientific appliances which surround them; and to furnish many other experiences which prepare children for life.

The playlet offered today takes us to the industrial-arts department in a typical Minneapolis junior high school. It is the period for school clubs, and the Craftsman's Club is meeting in the woodshop. Six members of this group are assembled in a small classroom adjoining the shop. Only the president of the club and the adviser know the purpose of this mysterious session. We hear the boys talking in low tones before being called to attention.

(*Music ceases — low voices — period bell rings.*)

PRESIDENT (*Raps with gavel*): As president of the Craftsman's Club, I call this committee meeting to order. (*Looks over group.*) Just one missing. Is John here? (*Pause.*)

JOHN (*Coming in late*): Here I am, I had to put away my model-airplane parts.

PRESIDENT (*In serious voice*): Boys, we have been asked to put on a demonstration in the auditorium at the spring meeting of the Parent-Teachers Association. I don't know much more than that about it except that the boys I was to select must have had shopwork in electricity, woodworking, mechanical drawing, and metalworking. I am going to ask our club adviser, Mr. James, to tell us more about it.

MR. JAMES: Mr. President and committee members: Mrs. Wentworth, the president of the P.T.A., would like to have a program which would be of interest and of value to the mothers there. She mentioned a demonstration on how to repair things about the home, such as the furniture or the doorbell, and the like. I suggest that you talk it over and work something out. I must return to the rest of the club, but will be glad to answer any questions before I leave.

WILLIAM: How many people will be there?

MR. JAMES: Oh, between two and three hundred women, I should imagine.

ALL (*Excitedly*): That many — some job — great guns — whew!

PRESIDENT (*Rapping for attention*): Boys!

JOHN: Do we have to be on the stage?

MR. JAMES: Yes, you do.

HENRY: How long?

MR. JAMES: It will be about twenty minutes. Are there other questions?

PRESIDENT: Thank you, Mr. James. I believe we can think up something. If we get stuck we may call on you!

(*Mr. James leaves, and the room is very quiet for a few moments.*)

HENRY: Boys, I guess we're in for it. *Two hundred women!*

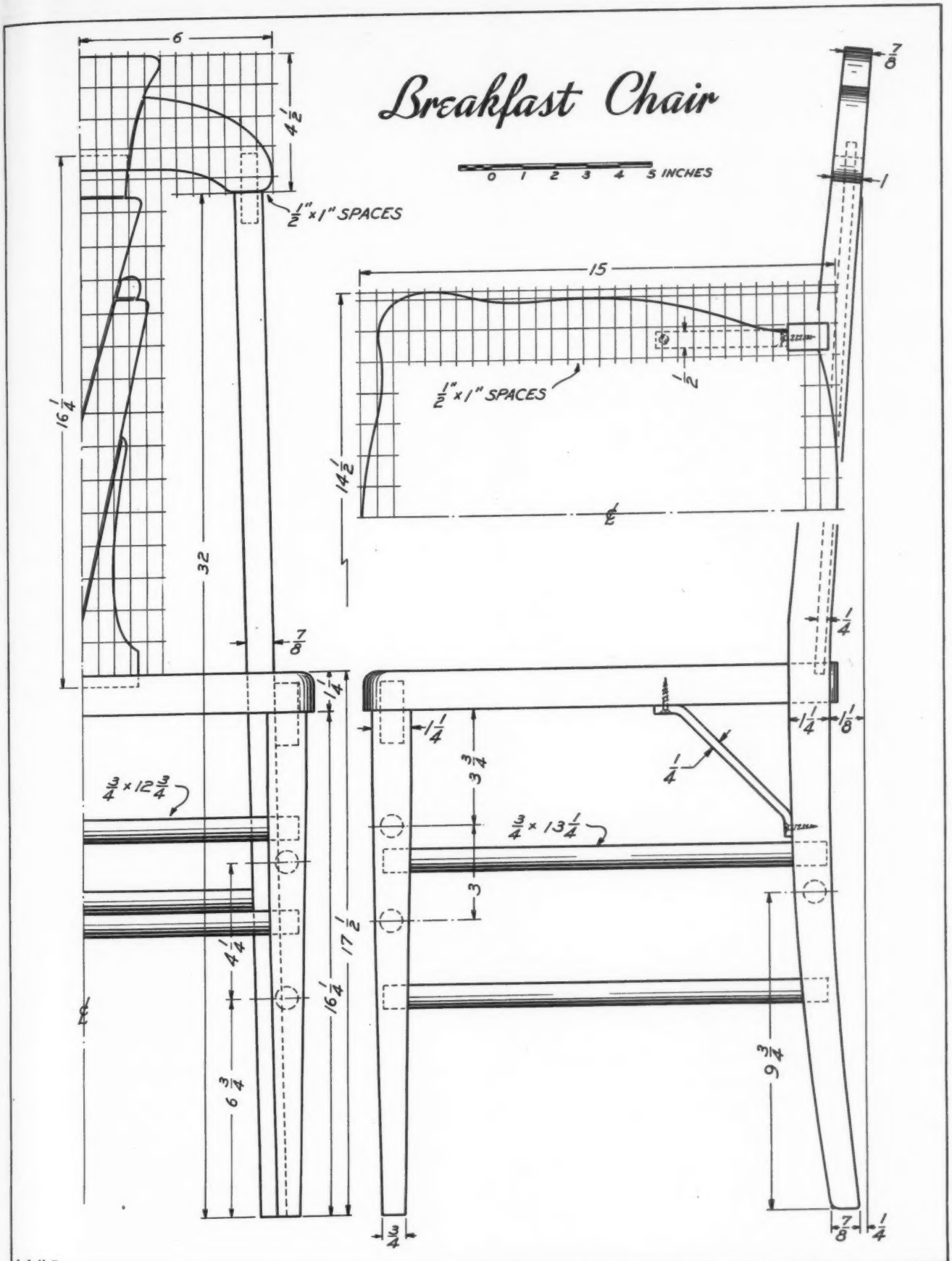
WILLIAM: And up on the stage! Whew!

GEORGE: I don't think it will be so bad.

PRESIDENT: No, I believe we can give a demonstration on how to fix something at home. (*Pause — thinking.*) We might have several small completed pieces of some furniture to show the difference in woods and finishes, and we could have many small pieces of wood with the names of each written on them and pass them out to the mothers. We also could add a few pieces of veneered wood and explain that in buying new furniture, the veneered furniture today is as good as solid wood. Who has an idea?

JOHN: I know, let's have a lot of electrical equipment there and show how to read an

(Continued on page 205)



Submitted by James Chadek, Woodworking Department, Appleton Vocational School, Appleton, Wisconsin

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JONES: Well — (*thinking*). Push that second button — no, there. The orders are coming in pretty well — (*slowly, as if thinking*). This new machinery is going to cut costs and we expect more business with the new prices. Therefore, production will be stepped up somewhat. We need a good diemaker, but that takes a good man.

(*Door opens again — enter Mr. Olson.*)

MR. OLSON: Did you buzz me, Mr. Brune? Oh — ah — excuse me, Mr. Jones. Ah — I didn't see you.

MR. JONES: Ole, can you use another rookie?

OLSON: Vell, eh vant a good diemaker, but eh guess eh can't get him. Who you got?

JONES: I remember your saying that the young fellow you took a couple of years ago is getting good. If you want another boy to train, talk it over with Brown there.

TOM: Okay, Mr. Olson, I know I can do it. Just let me try it.

OLSON: Okay, eh gif you a shance.

(*Exit — door opens, then closes.*)

Announcer:

And so Tom became a helper in the machine shop, because of his having taken several shop courses in high school. Varied experiences enrich the possibilities for employment, as technological changes take place. Of course, Tom will need to go to evening school in order to become proficient in his new work, but he has the possibility of working his way up, and a chance at being the boss some day. They all started at the bottom.

(*Music.*)

Radio Program No. 2

Program Sequence:

Music by band (*theme song*) to continue for 15 seconds and, if possible, to continue as background music to beginning of play.

Announcer:

Ladies and gentlemen, we are about to present a short play entitled *The Last Word,* prepared by the department of industrial arts.

The industrial subjects are offered to students from the seventh grade through the senior high school to acquaint young people with the vast field of industry; to furnish opportunities for self-expression in handwork and machine operation; to develop appreciations; to impart information useful to them as future consumers; to acquaint them with the mechanical and scientific appliances which surround them; and to furnish many other experiences which prepare children for life.

The playlet offered today takes us to the industrial-arts department in a typical Minneapolis junior high school. It is the period for school clubs, and the Craftsman's Club is meeting in the woodshop. Six members of this group are assembled in a small classroom adjoining the shop. Only the president of the club and the adviser know the purpose of this mysterious session. We hear the boys talking in low tones before being called to attention.

(*Music ceases — low voices — period bell rings.*)

PRESIDENT (*Raps with gavel*): As president of the Craftsman's Club, I call this committee meeting to order. (*Looks over group.*) Just one missing. Is John here? (*Pause.*)

JOHN (*Coming in late*): Here I am, I had to put away my model-airplane parts.

PRESIDENT (*In serious voice*): Boys, we have been asked to put on a demonstration in the auditorium at the spring meeting of the Parent-Teachers Association. I don't know much more than that about it except that the boys I was to select must have had shopwork in electricity, woodworking, mechanical drawing, and metalworking. I am going to ask our club adviser, Mr. James, to tell us more about it.

MR. JAMES: Mr. President and committee members: Mrs. Wentworth, the president of the P.T.A., would like to have a program which would be of interest and of value to the mothers there. She mentioned a demonstration on how to repair things about the home, such as the furniture or the doorbell, and the like. I suggest that you talk it over and work something out. I must return to the rest of the club, but will be glad to answer any questions before I leave.

WILLIAM: How many people will be there?

MR. JAMES: Oh, between two and three hundred women, I should imagine.

ALL (*Excitedly*): That many — some job — great guns — whew!

PRESIDENT (*Rapping for attention*): Boys!

JOHN: Do we have to be on the stage?

MR. JAMES: Yes, you do.

HENRY: How long?

MR. JAMES: It will be about twenty minutes. Are there other questions?

PRESIDENT: Thank you, Mr. James. I believe we can think up something. If we get stuck we may call on you!

(*Mr. James leaves, and the room is very quiet for a few moments.*)

HENRY: Boys, I guess we're in for it. *Two hundred women!*

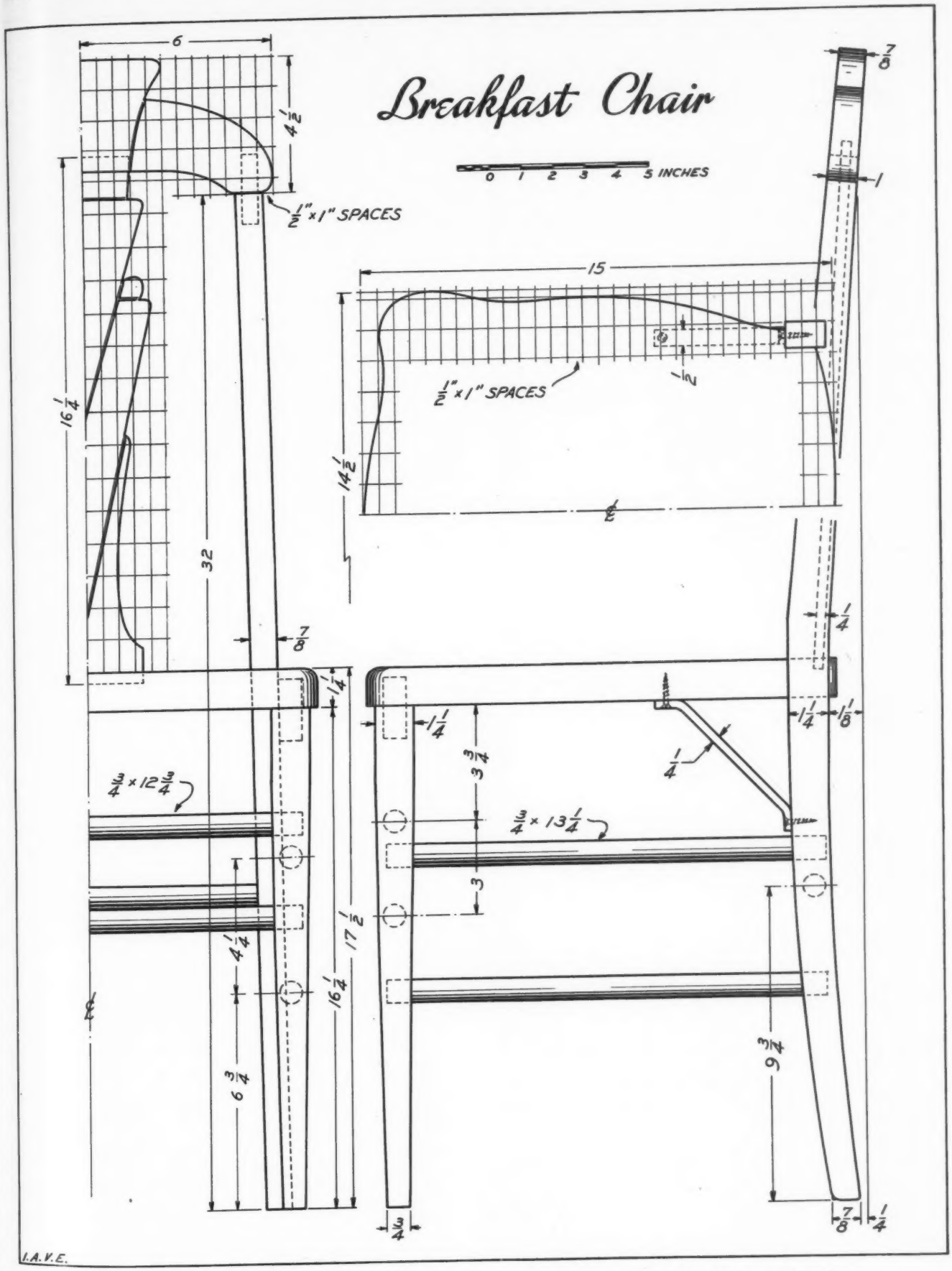
WILLIAM: And up on the stage! Whew!

GEORGE: I don't think it will be so bad.

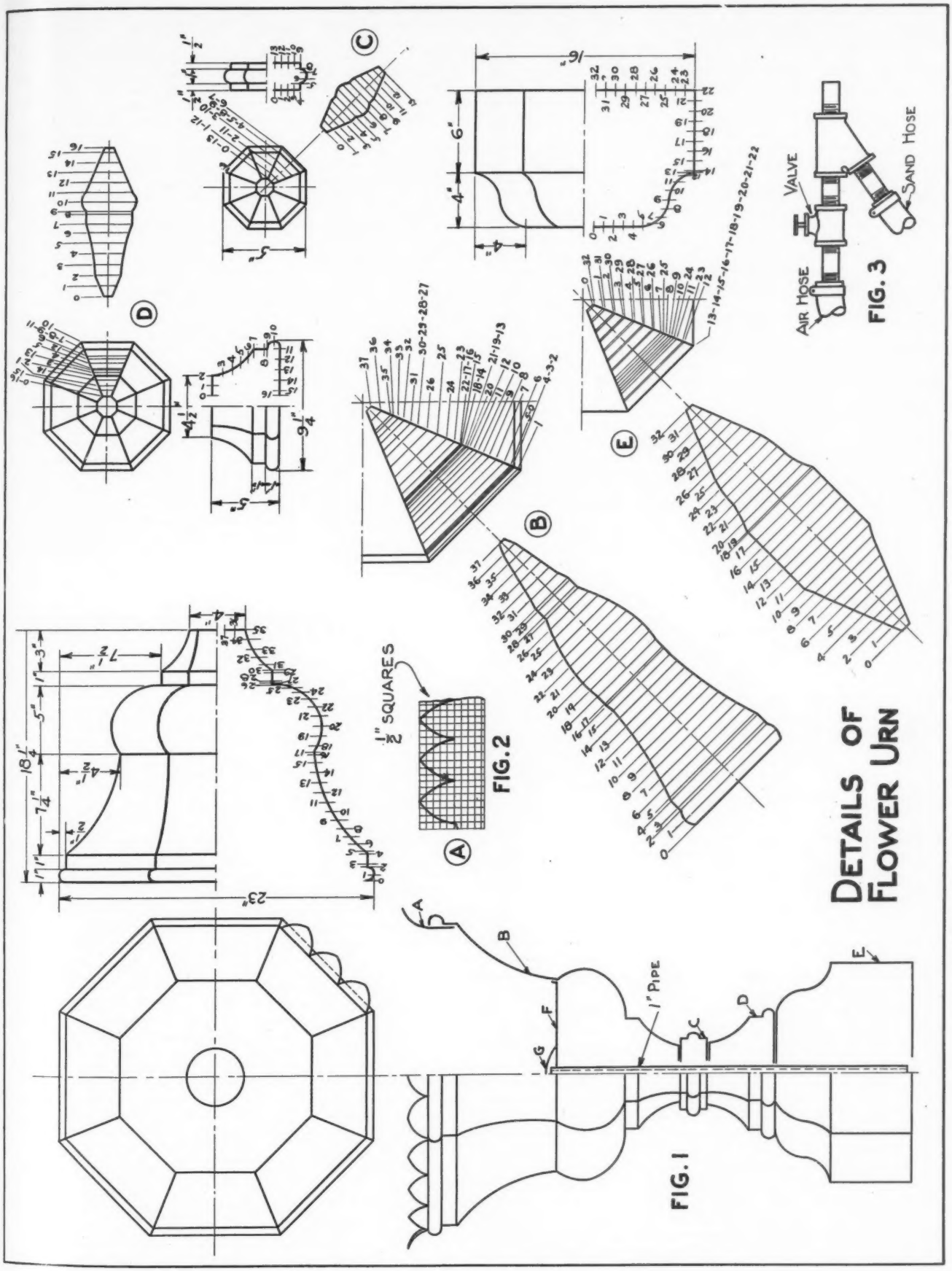
PRESIDENT: No, I believe we can give a demonstration on how to fix something at home. (*Pause — thinking.*) We might have several small completed pieces of some furniture to show the difference in woods and finishes, and we could have many small pieces of wood with the names of each written on them and pass them out to the mothers. We also could add a few pieces of veneered wood and explain that in buying new furniture, the veneered furniture today is as good as solid wood. Who has an idea?

JOHN: I know, let's have a lot of electrical equipment there and show how to read an

(Continued on page 205)



Submitted by James Chadek, Woodworking Department, Appleton Vocational School, Appleton, Wisconsin



Submitted by H. W. Kroll, Senior High School, Rockford, Ill. *(See descriptive material on page 207)*

(Continued from page 201)

electric meter, or — or — how to fix a flatiron cord, or — or — put in a fuse — or —

WILLIAM: No, that's too difficult to show a big crowd, with all those little connections and all that. Why not show them how to figure the electric cost per hour of running a new mangle, or a radio, or a flatiron, or a new electric stove?

PRESIDENT: I'm afraid any electrical demonstration would become too involved. You know — too hard for the mothers to understand without paper and pencil to copy down the rules and all that.

GEORGE: We could show them how to solder a hole shut in a pan or tea kettle, or how to fix a broken coal shovel.

HENRY: Yeah, how about driving nails or fixing a broken chair! My dad always tells my mother to hold the hammer with both hands so she won't hit her finger!

JOHN: My mother can hit a nail better than my dad.

WEE WILLIE: Mine, too!

PRESIDENT (*Raps*): We don't seem to be getting anywhere. (*Pause.*) I know! This is spring. I'll bet there are lots of mothers who want to refinish some of their old furniture. We might demonstrate a stain-shellac finish on an unfinished bookshelf.

GEORGE: You may do that to my bookcase that I put together today!

WILLIAM: Not a bad idea! (*Jumps up.*) That's it! Now we have it! We'll have George's bookshelf on the stage, and we can stain and shellac it right there.

HENRY (*Skeptically*): Yeah — and sit up there for days waiting for each coat to dry. Nice idea I —

PRESIDENT: No, we'll have several pieces of furniture that the boys have made in woodworking. One can be all sanded and ready to stain. We can apply the stain to that one and then shellac one already stained and dried!

GEORGE: Let me brush on the stain.

WEE WILLIE: I'll bring a bunch of old newspapers to spread on the floor.

HENRY: You'd better spread some on the ceiling if George is going to do the staining!

GEORGE: Aw, keep still, you!

PRESIDENT: Boys! (*Raps.*) While you boys are doing the work, how would it be for me to tell the audience what you are doing?

JOHN: Good idea. And tell them to buy an oil stain at any hardware or dime store.

WILLIAM: Yes, and to stain the edges of a board before the surface, and to wipe off the stain evenly with a cloth.

PRESIDENT: Then we'll move the bookcase that's already stained out in front and shellac it.

GEORGE: You'd better tell them to buy white shellac and use alcohol if it needs thinning.

PRESIDENT: Then we can move out another bookcase which has had one coat of shellac the day before. Then we'll sand it with fine sandpaper or steel wool until the surfaces are really smooth.

JOHN: There should be two coats of shellac! And they should remember to steel wool each coat of shellac and then to rub on the floor wax or furniture wax!

WEE WILLIE: Wax is put on just like shoe polish — isn't it?

HENRY: Shoe polish? Yeah, you rub on the wax, let it dry for a minute, and then shine.

PRESIDENT: Well — I believe that should be all —

HENRY: Yes, and we've done a great job!

PRESIDENT: I'll write out the parts for each of you to do.

ALL (*Confusion*): Great! That's swell — Aw, you, what did you do! etc.

(*A loud knock on the door. All quiet.*)

JOHN: There's somebody at the door!

WILLIAM (*In a low voice*): I'll bet we were making too much noise.

PRESIDENT (*Very low*): John, you go to the door.

(*All quiet. The door opens, and a girl enters.*)

ALL (*Sigh very loudly and give other signs of relief.*)

HENRY: And I really thought it *was* somebody! (*Pause.*) Hi, Myrt.

MYRTLE: You keep still, Henry. Boys, I hope you haven't done too much on *your* demonstration. We girls are going to have a demonstration, too, and of course ours comes *first* on the program. I just sneaked out of our meeting to tell you that we don't think there'll be any time for yours, so you just don't need to bother!

ALL: Aw, phooey — etc.

(*Music fades in.*)

Safety Education

R. M. Hammes

Director of Safety Education,
Abraham Lincoln High School,
Council Bluffs, Iowa

The terrific toll of life and limb in accidents during the past few years is making safety education an important factor in the curriculum of the school. Typical programs of safety education are those which deal with the problems of safety in walking, driving, or riding on the streets and highways. An investigation of the accident reports of the last year or two will reveal that fatalities and permanent injuries resulting from home accidents are as great in number as those caused by accidents in traffic.

"Accidents total ten million annually in this country. They constitute America's public enemy number one. In round numbers, they kill each year 100,000 of our men, women and children, and permanently cripple 370,000. Our Nation is aroused. It demands that something be done to reduce this frightful loss of life and limb. — Our Government and safety organizations are valiantly combating traffic accidents. We observe safety week and fire prevention week in our metropolitan areas. But home and farm accidents have until now received less attention. They are more individual and private, less public and spectacular."[1]

[1] *Group Discussion Material on Accident Prevention*, American Red Cross.

If safety education is to be efficient the "public and spectacular" must not be permitted to overshadow other equally important phases of the work. The teaching must be in response to a need indicated by surveys of the types of accidents occurring in the community, the state, and the nation. The National Safety Council has devised a simple system for reporting all accidents which involve children, regardless of where or when they occur, if such accidents are serious enough to require a doctor's care and cause a half day or more of absence from school. This system of reporting employs two types of forms, a card on which the pupil reports the details of the accident, and a summary sheet which classifies all accidents. The individual reports are filled in the administrator's office. At the end of the month they are sorted and grouped, first according to grade and then according to the type of accident as shown on the summary sheet. Each school system using a method of accident reporting is urged to forward a copy of the summary sheet to the National Safety Council, Statistical Division, 20 N. Wacker Drive, Chicago, Ill., where these are compiled and later made available. Samples of forms may be secured by writing to the Council. Student accident reports, in addition to supplying practical information for the safety program, also serve as a method of evaluating the efficiency of the school's safety program.

Helpful material for the teacher of safety.

Many state departments of public instruction have taken the lead in developing safety programs for the schools. Arkansas, California, Iowa, Indiana, Maine, Massachusetts, Michigan, Minnesota, Nebraska, New York, Oklahoma, Pennsylvania, and South Carolina have produced outlines of study and other valuable material for the safety program.

Organization of school programs varies from home-room periods given once a week to classes meeting daily. In some schools the course in safety is an established and accredited subject.

A safety program now set up in the Abraham Lincoln High School of Council Bluffs, Iowa, began with a compilation of sources of material. Books, pamphlets, charts, posters, games, and much other helpful material were gathered, studied, and carefully organized into progressive lessons to cover one year in advance of the inauguration of the program. One of the

school organizations sponsored the construction of a traffic demonstration board upon which might be set up any traffic problem. In this way, the situation causing accidents can be objectively studied and solutions more readily seen in a more impressive manner. Plans for such a board are found in *Traffic Safety Manual and Common Traffic Problems* (3). Models of vehicles, pedestrians, animals, service stations, etc., were purchased from toy shops, and the board constructed to the scale of the models. A junior safety council was formed by electing three representatives for each home room. Council members conduct the safety work in their respective rooms under the supervision of the home-room teacher. A general assembly of council members is held every Monday morning before the opening of school for the purpose of discussing the week's work and distributing material. Wednesday morning is used for the presentation of the lesson of the week. Evaluation of the program is accomplished through state driver's tests, and the accident report as suggested earlier in this article.

Following is an annotated list of "Materials for the Program." Many of these may be secured free of charge, some in quantity sufficient to supply each pupil with a copy. In this material will be found references to other material, and thus further sources may be contacted. In the list on "Sources of Material," the addresses of the firms or organizations issuing the materials are given. The numbers in this list refer to those found in the list on "Sources of Material."

Materials for the Program

TRAFFIC SAFETY

1. *Calling All Drivers.* A booklet of the effects of speed, traffic conditions, driving emergencies, and a check list for determining the safety of an automobile. *Free.*

2. *Instructional Units on Efficiency of Movement in Traffic and Automobile Operation.* An outline of topics for study.*

3. *Traffic Safety Manual and Common Traffic Problems.* An illustrated bulletin of traffic lessons with questions.*

4. *Direction, Regulatory and Warning Signs.* Blueprints of standard highway signs.*

5. *Driver's Handbook.* A booklet of information on the care of the car, garage hazards, rules of the road, and some accident report forms. *Free.*

6. *Highway Hazards.* Monthly lesson sheets on traffic safety. *Free.*

7. *How Good a Driver Are You?* A safe-driving examination.*

8. *I Drive Safely.* A booklet of safety factors in automobile construction, speed, brakes, vision, lights, first aid, and common rules to observe. *Free.*

9. *Invitation to Thinking Motorists.* A pamphlet with stickers for the speedometer inviting the motorist to join the "not over 50 club." *Free.*

10. *Let's Be Skillful.* An illustrated booklet of common traffic problems with solutions.*

11. *Motorist's Handbook.* A booklet of courteous driving rules, a chart of stopping distances, road signs, cautions to travelers on other states, a digest of motor vehicle laws of all states, and a cost tabulating chart. *Free.*

12. *Speed and Stopping Distances.* A chart showing relation of speed, thinking distances, and braking distances.*

13. *Common Traffic Problems.* A mimeographed circular of traffic problems with rules and illustrations.*

14. *We Drivers.* A booklet of a series of brief discussions on driving. *Free.*

15. *Preventable Accidents.* A booklet illustrating motor accident possibilities. *Free.*

16. *Death Begins at 40.* A booklet on accident statistics. *Free.*

17. *Fun with Facts.* Interesting experiments relating to automobile safety. *Free.*

FARM AND HOME SAFETY

18. *How Safe is Home?* A booklet describing home hazards and how they may be eliminated. *Free.*

19. *Group Discussion Material on Accident Prevention.* A booklet of lecture and group discussion material for farm and home accident prevention. *Free.*

20. *Accident Causes, How They May Be Prevented.* A booklet of causes and the prevention of injuries in the home. *Free.*

21. *Safe at Home.* An illustrated booklet of home hazards, requirements of a good first-aid kit, artificial respiration, and special child hazards. *10 cents.*

INDUSTRIAL SAFETY

22. *Stop Carelessness; Prevent Accidents.* A profusely illustrated booklet of all types of farm, home, and some traffic accident causes with a description of preventive measures. *10 cents.*

23. *Industrial Safety Education in Schools.* A monograph discussing the principles upon which effective safety education in school shops is based. *Free.*

24. *Catalog of Safety Bulletins.* A booklet of bulletins and dealing with all types of common hazards. *Free.*

GENERAL SAFETY

25. *Education for Safety.* A reprinted article from *Safety Education Magazine.**

26. *First Aid.* A booklet of first aid for all types of accidents. *Free.*

27. *Supplementary Instructional Aids in Safety Education.* A manual published bi-monthly for general safety education in schools. *50 cents.*

28. *Accident Facts.* An annual publication containing accident statistics for the previous year and comparisons with earlier years. *50 cents.*

29. *Safety Education.* A monthly publication. *$1 a year, $1.75 for two years.*

SOURCES OF MATERIAL

7, 10	The Aetna Casualty and Surety Company, Hartford, Conn.
19, 20	American Red Cross — your local Chapter.
27	Extension Division, University of Nebraska, Lincoln, Nebr.
14	General Motors Corporation, Department of Public Relations, Detroit, Mich.
11	The Hardware Mutual Casualty Company, Stevens Point, Wis.
8, 22	International Harvester Co., 606 So. Michigan Ave., Chicago, Ill.
5, 9, 15, 24	Lumberman's Mutual Casualty Company, Mutual Insurance Company, Mutual Insurance Building, Chicago, Ill.
1, 18, 23, 26	Metropolitan Life Insurance Company, New York City.
25	National Bureau of Casualty and Surety Underwriters, 60 John St., New York City.
21, 28, 29	National Safety Council, Education Division, 20 N. Wacker Drive, Chicago, Ill.
4, 12	State Highway Department — your own.
2, 3, 13	State of Iowa, Department of Public Instruction, Des Moines, Iowa.
6, 16, 17	Travelers Insurance Company, Hartford, Conn.

*No price indicated.

Lessons for Young Workers—X

Thomas Diamond

Vocational Education Department,
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Ann Arbor, Michigan

The tenth of a series of lessons for students of industrial arts and vocational education.

Difference Between Cost and Price

If you have ever worked in a factory, or if you have heard workers discuss the question, you may have heard some of them complain that they cannot understand why the articles they manufacture cost so much when they go to purchase them in the retail stores.

The worker in this particular case is perhaps justified in his complaint, as it is difficult to see why there is such a difference between the apparent cost of making an article and the actual price the person who buys it in the local store has to pay.

The difficulty with the complaining worker is that he sees only the more obvious items of cost and rarely does anyone take the trouble to inform him of the many others that go to make up the actual cost of an article. For example, he knows that he gets a fraction of a cent for the operation he performs on each piece. He may know also that the total received by all the individuals who work on the article does not exceed $5. From his familiarity with the cost of materials, he can see quite readily that the materials in the article can be purchased for not more than $5. This, to his mind, makes the cost of the article $10, when, as a

matter of fact, he has to pay $25 for it in the store. In other words he gets the idea that someone is collecting $15 profit on an article that he knows only cost $10 originally.

This seems like a glaring case of profiteering, and naturally the worker becomes disgruntled because apparently someone is paying him a relatively small wage and is collecting a large profit on the fruits of his labor.

In order to remove this impression, it might be well for someone to place before the worker some items of expense which would not usually occur to anyone not directly concerned with them.

In the first place, each successive operation on a piece of furniture is likely to remove material from the piece, either in the form of scrap, sawdust, or shavings. This waste material has been bought and paid for by the manufacturer, and he in turn must be paid for it if he is to remain solvent. Since this is true, it must be clear that although there is only $5 worth of material actually in the finished article, he must receive $5 plus the cost of the waste.

Rent, light, heat, power, and taxes must be paid by the manufacturer. Naturally enough, these must be added to the cost of the articles sold, which makes another increase over the worker's figure of $10.

Then, again, the articles must be sold, and the sales force must be paid. In the effort to sell, considerable advertising must be done. Selling and advertising may cost more than the actual labor on the article, but if this money were not spent, the chances are great that there would be no market for the articles, and the worker would be out of a job. Since this is true, they also constitute a legitimate addition to the selling price of the articles under consideration.

After the articles have been sold, they must be packed, stored, shipped, and stored again at their destination. All this handling costs money and this money must be obtained from the person who buys the article.

What about the clerk in the store? Does he not need to get a salary and must it not come out of the price paid for the articles he sells? What about the foreman, the sweepers, the stenographers, the pay clerk, the manager? Are they not entitled to something for their efforts even though they do not actually make the article? Where shall the money be obtained to pay them?

You will notice that not a word has been said about profit either for the manufacturer, the wholesaler, or the retailer. After all the items mentioned have been paid out of what the worker believed was $15 profit, will there be a great deal left to distribute between the three individuals who depend upon profit for the existence of their business?

The points to be made in this lesson are:

1. Workers' wages and finished material are not the only items to be considered in figuring the actual cost of an article.

2. It does not necessarily follow that someone is profiteering because the price of an article in the store is twice or even three times the cost of wages and materials.

Questions for Discussion

1. If the manufacturer owns his buildings, should rent be added to the cost of the articles made?

2. If he manufactures his own light and power should he be permitted to add their cost to the cost of the articles?

3. Why do some articles have to be extensively advertised while others do not?

4. Do you believe the men who travel around the country selling goods earn their money? Would you object to their salary being added to the cost of the goods you buy?

5. What reasons might be put forward for the manufacturer, the wholesaler, or the retailer making a profit?

Problems and Projects

A SHEET METAL FLOWER URN

H. W. Kroll, Senior High School, Rockford, Illinois

(For illustration see page 203)

A good problem for an advanced sheet-metal class, is shown in Figure 1.

This problem may be submitted to a small class in sheet-metal drafting, or it may be assigned as an individual piece of work. It does present, however, individual creation of design and proportion regardless of whether it is presented to a class or to an individual. The proportions and design given are merely suggestive. Original designs are preferable.

No. 24 gauge galvanized iron is used throughout.

The actual size of the leaf design is given in Figure 2. Half of the required number of leaves are laid out on one piece, making two pieces more convenient for handling.

No development of piece *F* is shown for the reason that its size varies according to the design of the body *B*. If this piece is inserted where shown, sufficient depth is secured for the soil required for plant growth.

A 1-in. pipe is used for drainage purposes, over which a piece of fine wire mesh may be placed or a piece of galvanized iron hammered to the shape shown. This piece of iron should contain a number of ⅛-in. holes through which water may pass for drainage purposes.

A very light cream color harmonizes well with outdoor surroundings, and also tends to make the piece appear so like real rock furniture that close examination is necessary to note the difference. By experimenting I have found that fine white crystal sand used in exterior painting serves best for this work. After applying a heavy second coat of paint, blow on the sand with the piece of apparatus suggested in the sketch shown in Figure 3. If air pressure is not available, use a painter's sand blower. More sand can be put on the surface with a forced-air blast than by tossing the sand by hand.

The surface of the urn which comes in contact with the earth should have a coat of asphaltum or several coats of heavy paint. This will give sufficient protection to the iron to keep it from rusting.

To balance the weight of the earth in the urn, fill the base with sand. This will give sufficient stability to the piece and not leave it top heavy.

The value of this project reaches out beyond the classroom. It encourages civic pride when placed on school grounds or private lawns.

TEMPLATES FOR PRODUCING DECORATIVE DESIGNS

Frank W. Bone, Adrian, Michigan

The best description of the system described herewith, will be specific directions for the routine procedure. They follow here:

Cut a piece of tough cardboard to any irregular shape, about 2 in. long and 1½ in. wide.

Avoiding the center of the piece, draw a straight line across it anywhere, from edge to edge.

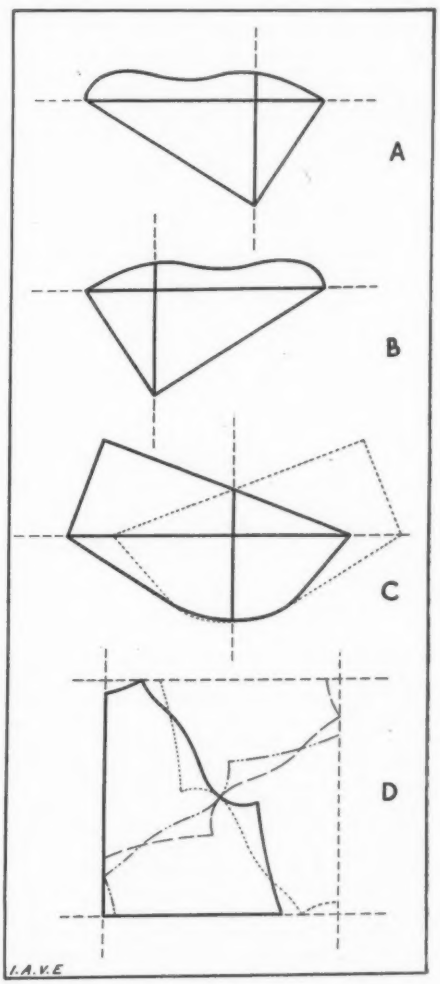


Fig. 1

This piece of cardboard is to be used as a template for tracing the routines of outlines that are the basis of the system.

The lines that were drawn across the face of the template are registration lines for locating the template in the various positions of a routine.

Place the template, with the registration lines up, on a piece of carbon paper with the pigment side up. With a ruler and a dull pointed instrument that can be used as a stylus, trace heavily over the registration lines and, with the aid of the carbon paper, reproduce those lines on the underside of the template. This second pair of crossed lines is to be directly opposite the first pair, point for point. At *A* and *B*, in Figure 1, are shown the two faces of one template. The broken lines represent the registration lines that must be lightly penciled on the surface that is to receive the design.

On a piece of white paper, draw a straight, rohizontal line, slightly longer than the template. Crossing this line at its middle, draw a vertical line of the same length and extending equal distances above and below the horizontal line.

Lay the template, either side up, over these lines, with the lines on the template matching the lines on the paper, as shown at *A* and *B*, in Figure 1. With a pencil, trace the outline of the template and turn it to the right until all registration lines match again. Trace the outline again and repeat until the outline has been traced in four positions as shown at *C* in Figure 2. The template used for producing this outline is shown at *C*. Next, turn the template over, bringing the other face up, register over the same lines and trace again, in four positions, making eight tracings in all. The result of this routine, using template *C*, is shown at *C*, in Figure 2.

Next, the design is to be completed by shading. This consists of separating the spaces into two or three intermingled groups and giving each group a distinctive shade, or tone. The spaces in each group should, collectively, form a pleasing figure. The distinguishing tones may be in colors or merely white, gray, and black. The effect of gray can be produced by roughly parallel, or exactly parallel, black lines on white paper.

In developing a design from the traced outlines it is usually desirable to erase some of the lines. This may be freely done, to any desired extent.

Each of the designs shown in Figure 3 is a development of the routine tracing shown at *C* in Figure 2. Some of the traced lines were erased. None were added.

Another arrangement of registration lines is shown at *D*, in Figure 1. In this type of registration the lines on the receiving surface are laid out in the form of a rectangle, either square or oblong. It is most convenient to use a template with two edges that meet at a right angle, and to use these edges as registration lines. In placing the template in position its square corner is fitted inside one of the corners of the rectangle. At *D* in Figure 1, the solid lines represent a template in one of its positions. Three other positions are shown in broken lines. The registration lines of the receiving surface are also shown in broken lines. The routine is to be completed by turning the template over and again tracing one position in each corner.

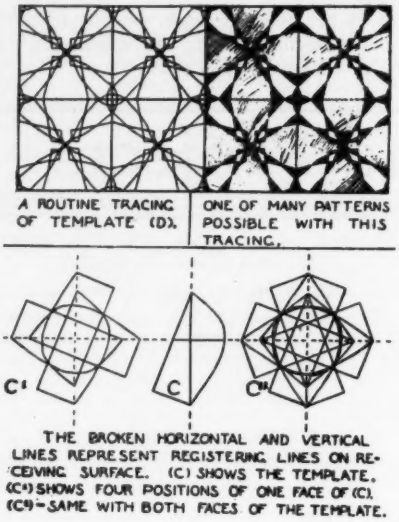

A ROUTINE TRACING OF TEMPLATE (D).
ONE OF MANY PATTERNS POSSIBLE WITH THIS TRACING.
C'
C
C''
THE BROKEN HORIZONTAL AND VERTICAL LINES REPRESENT REGISTERING LINES ON RECEIVING SURFACE. (C) SHOWS THE TEMPLATE. (C') SHOWS FOUR POSITIONS OF ONE FACE OF (C). (C'') = SAME WITH BOTH FACES OF THE TEMPLATE.

Fig. 2

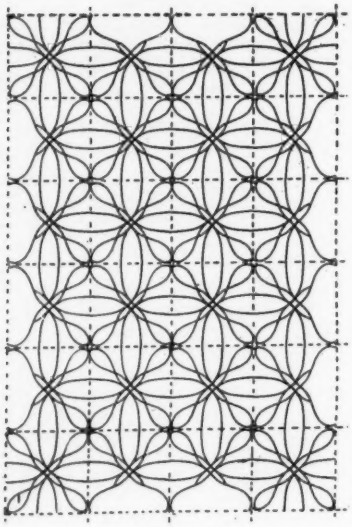


Fig. 5

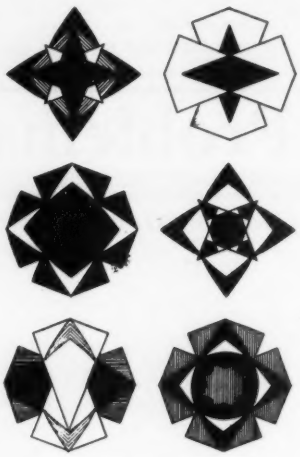


Fig. 3

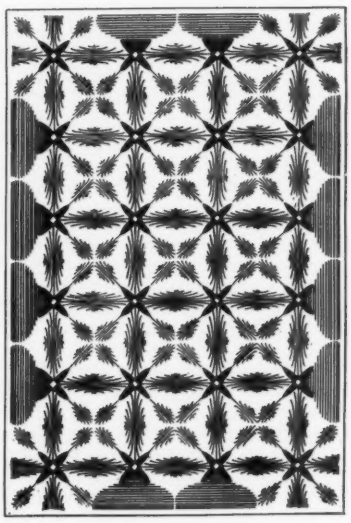
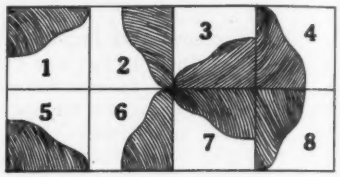


Fig. 6



SHOWING TEMPLATE (A) IN A ROUTINE OF EIGHT POSITIONS WITHIN A SQUARE AND AGAINST THE SIDES OF THE SQUARE.

BELOW ARE SHOWN EIGHT SQUARES-EACH CONTAINING TRACINGS OF (A) IN ALL OF THE EIGHT POSITIONS.

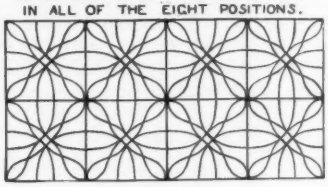
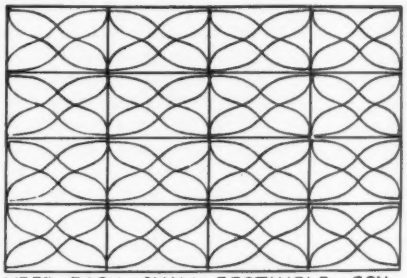
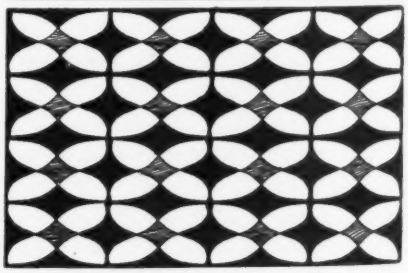


Fig. 4



HERE EACH SMALL RECTANGLE CONTAINS OUTLINES OF FOUR POSITIONS OF TEMPLATE (A).



DESIGN DEVELOPED BY SHADING.

Fig. 7

This complete routine may be seen in the upper part of Figure 2, where a block of eight squares is shown, forming an oblong rectangle. Four of these squares are without shading and in each of these there are tracings of the eight positions of template *D*, Figure 1. The four shaded squares show a development of these tracings. It is convenient to have the shortest side of the rectangle slightly longer than the template, but

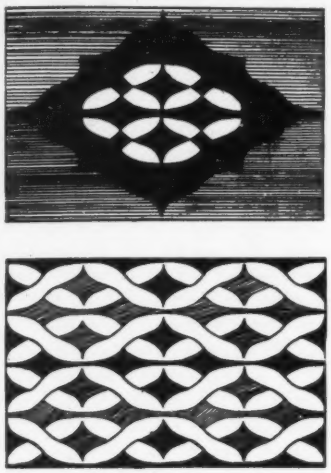


Fig. 8

this is not necessary. If the template extends beyond the limits of the rectangle in some positions, one can omit those positions or trace only the part within the rectangle.

In the upper part of Figure 4, is a block of eight squares, each showing a registration in a different position, of the template shown at *A* in Figure 1.

In the lower block of squares in Figure 4, all eight positions are outlined in each square, and this block is repeated in Figure 5, with a border of sixteen additional squares, from some of which a few lines have been erased.

Figure 6 shows a development of the tracing pictured in Figure 5.

In the upper portion of Figure 7, there is a block of sixteen rectangles, each containing a routine of tracings of template *A* shown in Figure 1. Those positions of the template which could not be contained entirely within a single rectangle of the size shown have been omitted. In the lower portion of the same plate can be seen a development of these tracings.

Any change in the shape of a template, or in the location of the registration lines on its faces, will result in the production of differently shaped figures.

It is apparent that there are many other ways in which such tracings might be assembled. To describe them all would be impossible.

Templates may be of any size or shape but irregular shapes are generally most satisfactory.

MODERNISTIC CANDLESTICK

Leon H. Baxter, Association for Crippled and Disabled, Cleveland, Ohio

The candlestick shown on Plate 9 may be easily spun on a lathe, but to many, spun work has not the appeal that hand-executed craftsmanship shows.

Each of the varying size disks is shaped on a lead block as shown in Figure 1. They must be planished and trued up carefully. Disk *A* is 2⅜ in. in diameter; disk *B*, 3⅜ in.; disk *C*, 4½ in.; and disk *D*, 5½ in. Each of these disks also has a hole sawed out at the center point equal in diameter to the shaft *E*. This requires considerable care in both operations of forming a symmetrical shaft and accurately sawing and filing a hole to fit the shaft snugly. Shaft and disks are all planished. The shaft is shaped by hammering the 2⅞ by 3¼-in. sheet of 18-gauge copper around a piece of pipe. The finished shaft should have a ⅞-in. inside diameter. All of the disks may then be soldered to the shaft at one operation. To do this, cut three blocks of wood for each space, thick enough

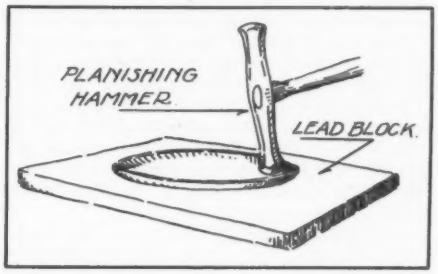


Fig. 1. Method of spacing

to support the various disks at the correct height from the disk below. These blocks should be as small in area as possible so as to allow the flame of the blowtorch to reach the desired points. Small pieces of solder and flux should be applied about the edge of the shaft where it passes through the disks. When everything is ready, apply the heat. See "Soldering," page 305, September, 1938, of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Clean all parts thoroughly with fine steel wool and finish as suggested under "Finishing," page 306, September, 1938, of this magazine.

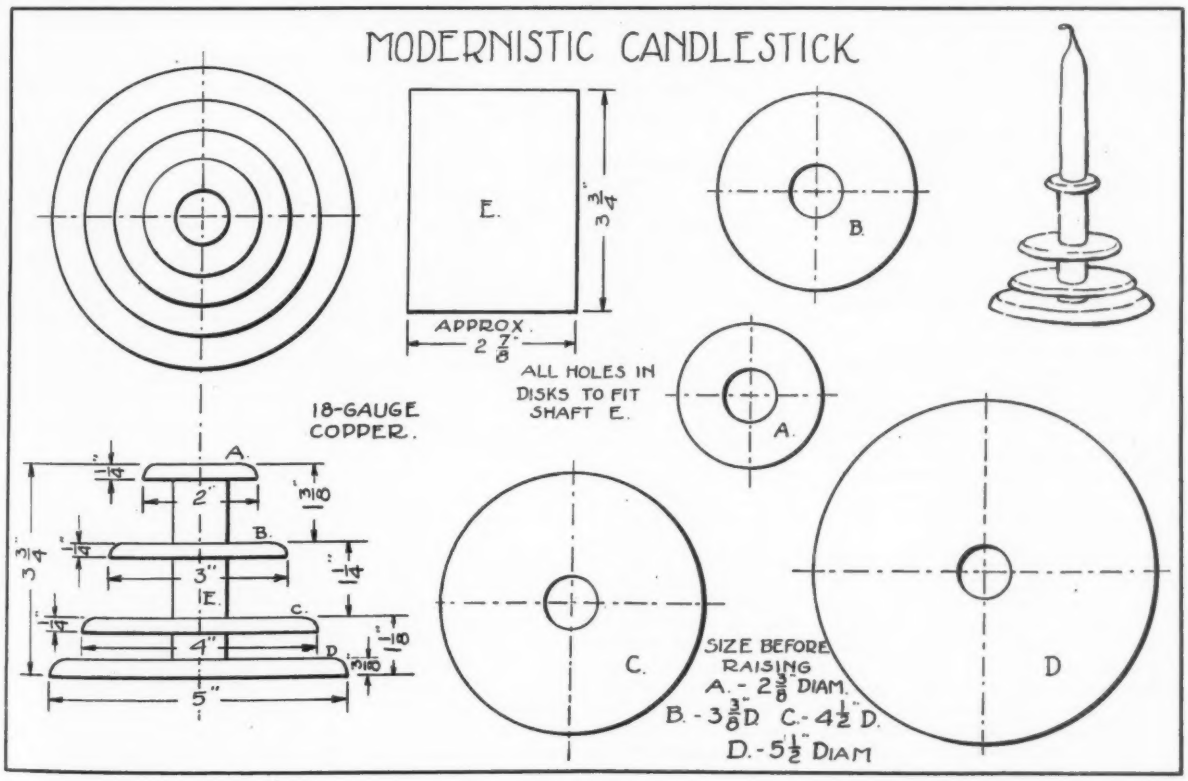


Fig. 9

ARE YOU SURE OF YOUR SCALE?

August Flam, Head, Industrial-Arts Department, John Marshall High School, Los Angeles, California

If, on a bright day, one of your young hopefuls in drafting should ask permission to use a scale of ⅜ in. equal to 1 in. pray do not, in a moment of weakness, yield. The student may have good reasons for making such a request, or he may be doing it merely through ignorance. However, such unguarded consent is bound to lead to embarrassment sooner or later. All the markings on the usual architect's scale are intended for reductions of the full size to so and so many inches per foot, and never for reductions per inch. This is often ignored, and the young draftsman is apt to select a scale of ½ in. or ⅜ in. to the inch. The smaller divisions will then yield 12ths, 24ths, and 48ths of an inch. Obviously an explanation to the class would indicate such misuse of the scale.

Also the manner of designating the scale on a drawing seems to be somewhat chaotic. An examination of several leading textbooks on drafting, as well as samples of drafting by men in industry, reveals a woeful lack of clarity, as well as lack of agreement as to what constitutes good practice. It is quite common to use the notation: Full size or full scale on a drawing, which in itself is not at all bad, but would be clearer if the statement were changed to Scale: 12" — 1 ft. But the designations half size and half scale may be confusing. Half size denotes a scale of 6 in. to the foot, whereas half scale may be looked upon by some as 6 in. to the foot, and to others it may mean a scale of ½ in. to the foot. Similarly in the case of the commonly used terms *quarter size* and *quarter scale*. The first of these means definitely 3 in. equals 1 ft., to some the second method may mean 3 in. equals 1 ft., and to others, ¼ in. equals 1 ft.

Looseness of expression, such as the foregoing illustrate, is unbecoming to the dignity of our work. Besides, there is no valid excuse for this condition. The scale can and should be made definite and clear beyond all criticism. It is well, therefore, in all cases to indicate the scale in the following manner: Scale: 12" — 1 ft., or Scale: 6" — 1 ft., or Scale: 3" — 1 ft., or Scale: ¼" — 1 ft.

There is no possible chance of mistaking the meaning when the scale is so specified.

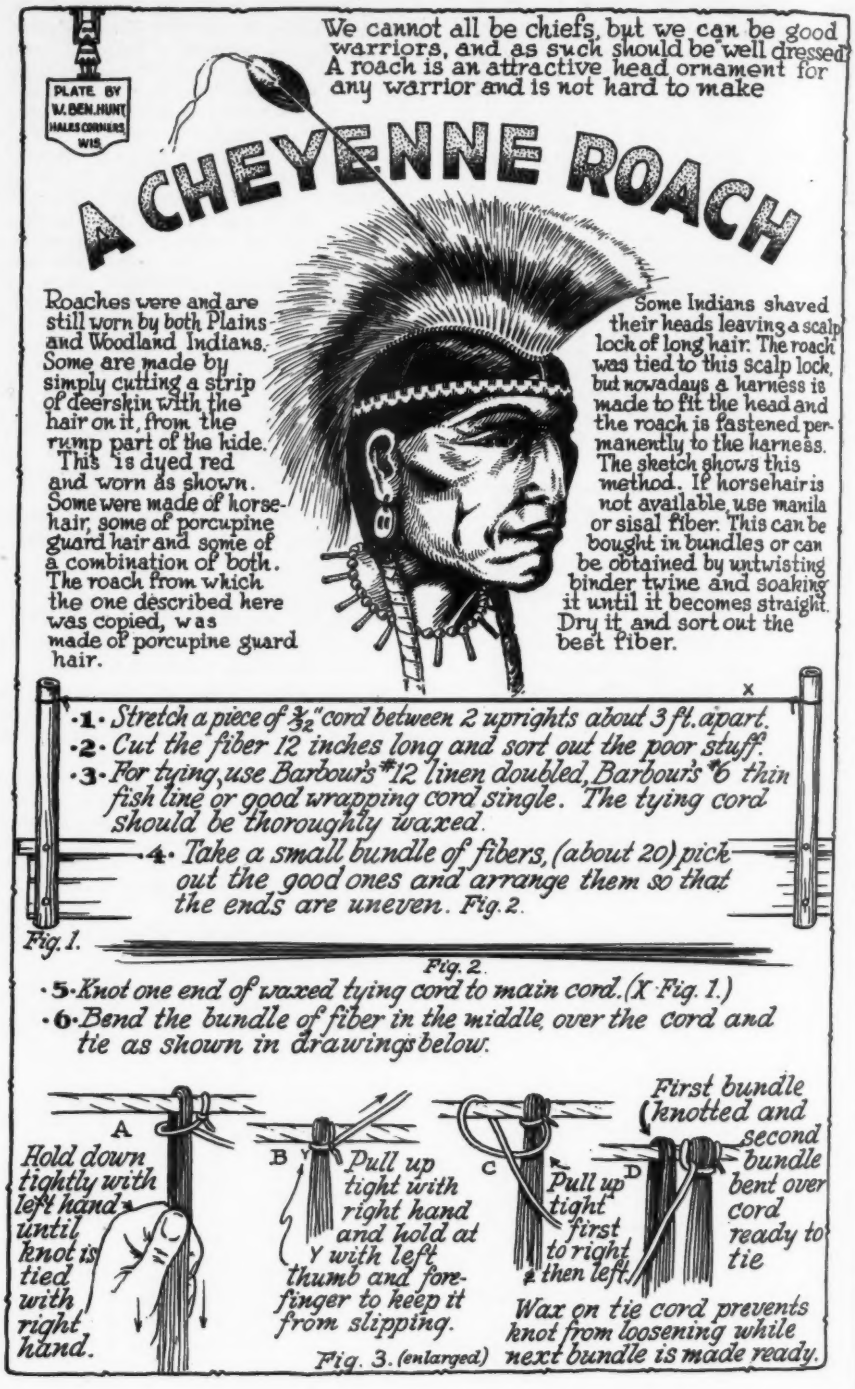


PLATE BY W. BEN HUNT HALES CORNERS WIS.
We cannot all be chiefs, but we can be good warriors, and as such should be well dressed. A roach is an attractive head ornament for any warrior and is not hard to make
A CHEYENNE ROACH
Roaches were and are still worn by both Plains and Woodland Indians. Some are made by simply cutting a strip of deerskin with the hair on it, from the rump part of the hide. This is dyed red and worn as shown. Some were made of horsehair, some of porcupine guard hair and some of a combination of both. The roach from which the one described here was copied, was made of porcupine guard hair.
Some Indians shaved their heads leaving a scalp lock of long hair. The roach was tied to this scalp lock, but nowadays a harness is made to fit the head and the roach is fastened permanently to the harness. The sketch shows this method. If horsehair is not available use manila or sisal fiber. This can be bought in bundles or can be obtained by untwisting binder twine and soaking it until it becomes straight. Dry it and sort out the best fiber.
X
1. Stretch a piece of 3/32" cord between 2 uprights about 3 ft. apart.
2. Cut the fiber 12 inches long and sort out the poor stuff.
3. For tying, use Barbour's #12 linen doubled, Barbour's #6 thin fish line or good wrapping cord single. The tying cord should be thoroughly waxed.
4. Take a small bundle of fibers, (about 20) pick out the good ones and arrange them so that the ends are uneven. Fig. 2.
Fig. 1.
Fig. 2.
5. Knot one end of waxed tying cord to main cord. (X Fig. 1.)
6. Bend the bundle of fiber in the middle over the cord and tie as shown in drawings below.
A
Hold down tightly with left hand until knot is tied with right hand.
B
Pull up tight with right hand and hold at Y with left thumb and forefinger to keep it from slipping.
C
Pull up tight first to right then left.
D
First bundle knotted and second bundle bent over cord ready to tie
Wax on tie cord prevents knot from loosening while next bundle is made ready.
Fig. 3. (enlarged)

GETTING JOBS ON GRADUATION

L. A. Barrett, Principal, High School, Salida, Colorado

No question is of more importance to the majority of high-school seniors about this time of the year than that of getting a job. In spite of the fact that about two thirds of the graduates of most high schools nowadays have no thought or inclination of going to college, all too many secondary schools continue to exert their best efforts on those who are heading toward the professions, and slight those who are not.

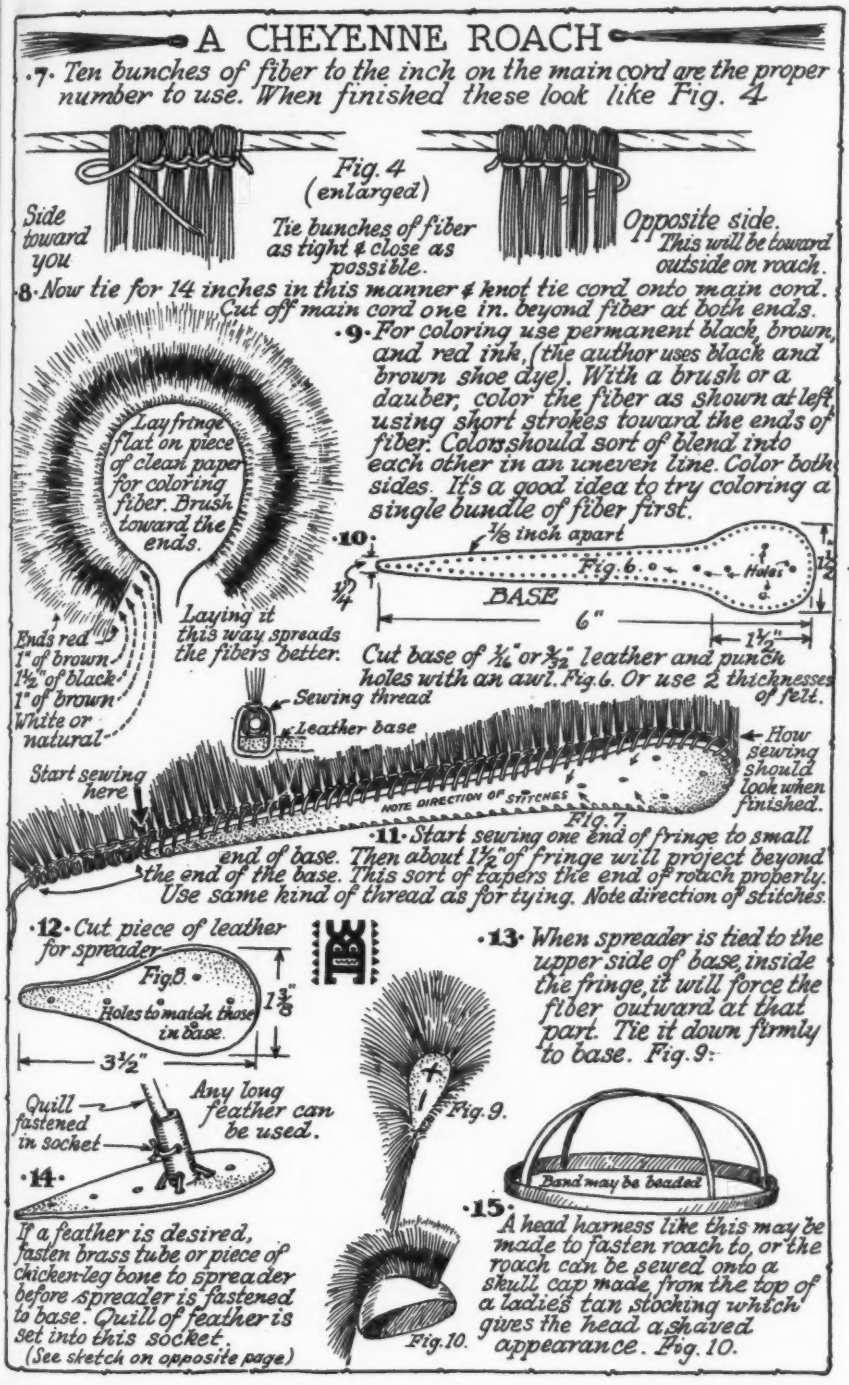
It is true that most schools give a bit of work in the so-called vocational courses, but when graduates attempt to find jobs on the basis of their high-school experiences, they usually find that employers will not receive them with open arms.

The industrial-arts and commercial departments of the Salida High School have been trying a plan for three years, which, while it is still far from perfection, is unquestionably filling the needs of dozens of our graduates by making it possible for them to get jobs on graduation in the fields of their choice.

About the middle of the senior year, those commercial and industrial students who wish to make the experiment are called together and are asked to select the field which they wish to enter for a life's work. One at a time, they talk over their likes and dislikes, their weaknesses and strong points, with the coordinator, and try to decide upon their choice.

After each boy has indicated the line of endeavor which he wishes to follow, the coordinator goes into the community and tries to find a proprietor, a shopkeeper, or a foreman who will be willing to take a senior-high-school boy under his guidance for eighteen weeks in exchange for what work the youngster may give him, and teach him the fundamentals of his particular field.

For example, suppose a boy decides he would like to work in a hardware store. Graduation from an ordinary high school will find him unemployable since his four years of school have taught him but little of practical value about the shop. But if the lad works three hours a day for eighteen weeks in a store wherein he will be taught what kind of screws are best for a given


A CHEYENNE ROACH
·7· Ten bunches of fiber to the inch on the main cord are the proper number to use. When finished these look like Fig. 4
Fig. 4 (enlarged)
Side toward you
Tie bunches of fiber as tight & close as possible.
Opposite side. This will be toward outside on roach.
·8· Now tie for 14 inches in this manner & knot tie cord onto main cord. Cut off main cord one in. beyond fiber at both ends.
·9· For coloring use permanent black, brown, and red ink. (the author uses black and brown shoe dye). With a brush or a dauber, color the fiber as shown at left, using short strokes toward the ends of fiber. Colors should sort of blend into each other in an uneven line. Color both sides. It's a good idea to try coloring a single bundle of fiber first.
Lay fringe flat on piece of clean paper for coloring fiber. Brush toward the ends.
Laying it this way spreads the fibers better.
Ends red 1" of brown 1½" of black 1" of brown White or natural
·10·
⅛ inch apart
Fig. 6.
Holes
BASE
6"
1½"
Cut base of 1/16" or 3/32" leather and punch holes with an awl. Fig. 6. Or use 2 thicknesses of felt.
Sewing thread
Leather base
How sewing should look when finished.
Start sewing here
NOTE DIRECTION OF STITCHES
Fig. 7.
·11· Start sewing one end of fringe to small end of base. Then about 1½" of fringe will project beyond the end of the base. This sort of tapers the end of roach properly. Use same kind of thread as for tying. Note direction of stitches.
·12· Cut piece of leather for spreader
Fig. 8.
Holes to match those in base.
1⅜"
3½"
·13· When spreader is tied to the upper side of base, inside the fringe, it will force the fiber outward at that part. Tie it down firmly to base. Fig. 9.
Fig. 9.
Quill fastened in socket
Any long feather can be used.
·14·
If a feather is desired, fasten brass tube or piece of chicken-leg bone to spreader before spreader is fastened to base. Quill of feather is set into this socket.
(See sketch on opposite page)
Band may be beaded
·15· A head harness like this may be made to fasten roach to, or the roach can be sewed onto a skull cap made from the top of a ladies' tan stocking which gives the head a shaved appearance. Fig. 10.
Fig. 10.

job; what kind of fishing tackle is best for various kinds of streams; how to set up stoves; how to unpack radios and assemble them; whether nails sell by the peck or by the pound. When he learns all about nails, nail sizes, bit sizes, and the thousand and one little things that a hardware clerk should know, then it is likely that at the end of eighteen weeks he will have grown indispensable to his employer and will get a full-time job just as soon as he graduates. In the Salida Plan, these student workers are not allowed to accept pay nor may they be used by employers to replace any workers already on the pay rolls.

Seniors have been placed in a variety of jobs, such as greenhouses, butcher shops, hardware stores, printshops, garages, welding shops, ready-to-wear stores, grocery stores, and tire-repair shops. All of these workers have a background of 3½ years of either commercial subjects or shop courses with the final half year giving that essential link between the school and the practical employment situation.

That the plan is workable is evidenced by the fact that during the three years the plan has been in operation, 50 per cent of the workers were retained and still are in the places wherein they got their training, while another 30 per cent are employed in jobs similar to those in which they had their preliminary tryouts.

The big advantage the school officials find in this plan is that it makes it possible for a senior to get actual experience in the field of work of his choice before graduation, rather than make him wait until graduation and then force him to accept the first job that presents itself, regardless of his fitness or qualifications for it.

A TEST-CHECKING MACHINE

S. R. Harding, Head, Industrial-Arts Department, City Schools, Aberdeen, South Dakota

For a number of years I have been experimenting with various mechanical ways of checking objective test papers. The machine shown in the illustration below is motor driven and is automatic. It is designed to operate as outlined in the following. The placing of the student's answer sheet in the machine engages a clutch which starts the machine on a cycle of operations. First an upper segment of the machine comes down upon

Test-checking machine

the answer sheet holding it firmly in place while 1,000 selector pins accurately select the wrong answers. Almost simultaneously, marks are placed by each wrong answer, the wrong answers are counted by an electrically operated counter which prints its findings in the upper-right-hand corner of the student's answer sheet.

During the five seconds required for the above operations, other parts of the machine have indicated, on a *frequency-of-error* sheet, the particular questions missed by the student. This frequency-of-error sheet remains in the machine until all of the papers for a class have been checked. When it is removed from the machine, the teacher sees at a glance the number of times each question has been missed. This record emphatically shows the strong and the weak places in the work. It serves as a most valuable aid in planning future instruction.

The machine will check true-false, multiple-choice, matching questions, and many variations of these forms.

The "Snap-E-Check" student's answer sheet has 1,000 small circles printed upon it. Five circles are allotted to each question. The student indicates his answer by piercing the circle of his choice with the point of his pencil. A punched key sheet prepared by the teacher controls the action of the machine.

Incidentally I have found that my work with this project has been of much value to me as a shop teacher. In searching for metals best adapted to certain parts of the machine, I found it necessary to make a rather extensive study of the characteristics of numerous metals. The necessity for dies for making certain duplicate parts led me to explore

the field of diemaking. Although the dies were made by Mr. Nelson, who has helped with the building of the machine, and myself, they were later used to advantage in a study of dies by my high-school shop classes.

The fact that this machine has been built in a home workshop equipped with no power machinery other than a drill press, an 8-in. circular saw, and a homemade punch press, emphasizes the possibilities of both bench metalwork and the home workshop. Much of the metal cutting was done with abrasion wheels mounted in the circular saw.

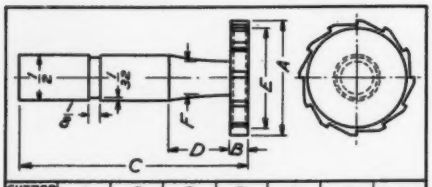
As a result of this project, I am now teaching, in my general shop, a type of general metalwork not formerly attempted.

KEYWAY CUTTER

Edwin M. Moe and W. H. Bugg, Morton Senior High School, Richmond, Indiana

The illustration shown herewith presents a keyway cutter and dimensions of woodruff keyway cutters from size 1 to size G.

These cutters may be made from any good tool steel. Cutters are made of 100-point carbon steel, hardened at 1450 deg. F., and tempered to 450 deg. F.



CUTTER NO.	A	B	C	D	E	F	FLUTE
1	1/2	1/16	2 1/16	1/4	5/16	1/4	8
2	1/2	5/32	2 3/32	1/4	5/16	1/4	8
3	1/2	1/8	2 1/8	1/4	5/16	1/4	8
5	5/8	1/8	2 1/8	5/16	3/8	1/4	8
7	3/4	1/8	2 1/8	3/8	1/2	3/8	10
9	3/4	1/16	2 1/16	3/8	1/2	3/8	10
11	7/8	1/16	2 1/16	7/16	5/8	3/8	10
A	7/8	1/4	2 1/4	7/16	5/8	3/8	10
13	1	1/16	2 1/16	1/2	11/16	3/8	10
15	1	1/4	2 1/4	1/2	11/16	3/8	10
B	1	5/16	2 5/16	1/2	11/16	3/8	10
16	1 1/8	1/16	2 1/16	9/16	3/4	3/8	12
18	1 1/8	1/4	2 1/4	9/16	3/4	3/8	12
C	1 1/8	5/16	2 5/16	9/16	3/4	3/8	12
19	1 1/4	1/16	2 1/16	5/8	1	3/8	12
21	1 1/4	1/4	2 1/4	5/8	1	3/8	12
D	1 1/4	5/16	2 5/16	5/8	1	3/8	12
E	1 1/4	3/8	2 3/8	5/8	1	3/8	12
22	1 3/8	1/4	2 1/4	11/16	1 1/16	3/8	12
23	1 3/8	5/16	2 5/16	11/16	1 1/16	3/8	12
F	1 3/8	3/8	2 3/8	11/16	1 1/16	3/8	12
24	1 1/2	1/4	2 1/4	3/4	1 1/4	3/8	14
25	1 1/2	5/16	2 5/16	3/4	1 1/4	3/8	14
G	1 1/2	3/8	2 3/8	3/4	1 1/4	3/8	14

Keyway cutter table

The flutes are cut with a straight mill, but if an 80-deg.-angle cutter is available, the depth of tooth is improved.

The outside diameters of the cutters and of the shanks should be turned .020 in. oversize. They are then ground to size after the cutters have been hardened and tempered.

LOW-VOLTAGE DISTRIBUTION SYSTEM

Waldo E. Webb, Shaw Junior High School, Washington, D. C.

Batteries are much used for teaching fundamentals of electricity to junior-high pupils. Principles can be taught through use of low voltage without danger to pupils. But batteries are expensive, and are easily ruined through short circuits by beginners. They are exhausted before the end of the semester when used constantly, where classes are large.

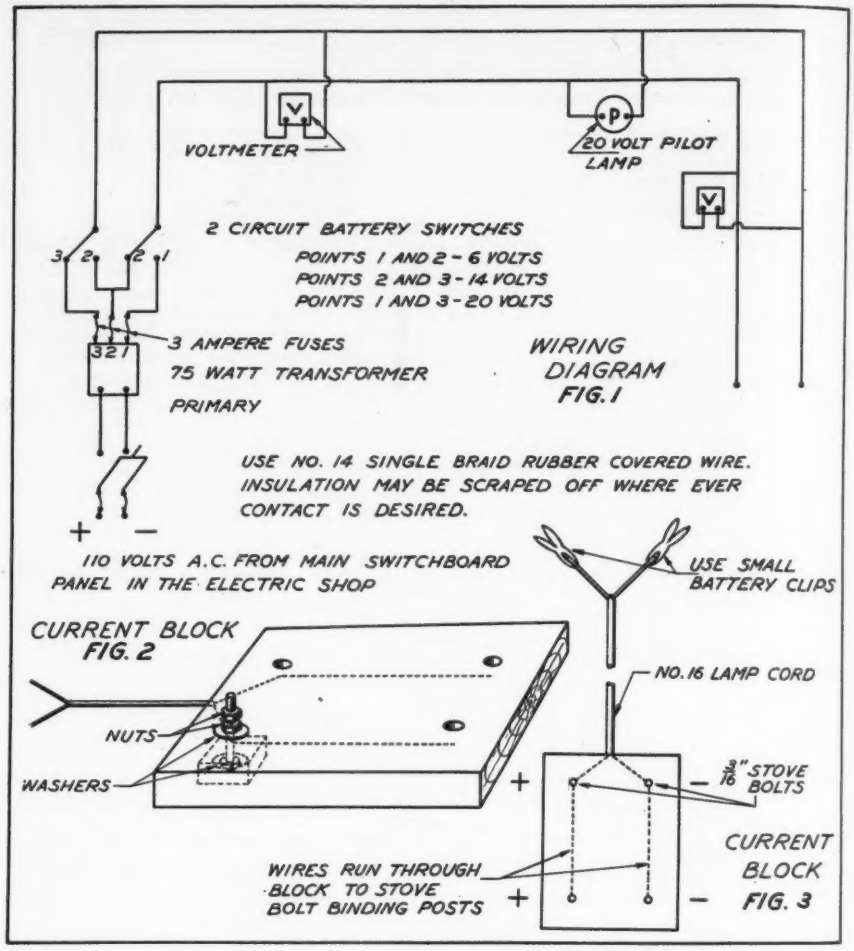

VOLTMETER
20 VOLT PILOT LAMP
2 CIRCUIT BATTERY SWITCHES
POINTS 1 AND 2 - 6 VOLTS
POINTS 2 AND 3 - 14 VOLTS
POINTS 1 AND 3 - 20 VOLTS
3 AMPERE FUSES
75 WATT TRANSFORMER
PRIMARY
WIRING DIAGRAM FIG. 1
USE NO. 14 SINGLE BRAID RUBBER COVERED WIRE.
INSULATION MAY BE SCRAPED OFF WHERE EVER
CONTACT IS DESIRED.
110 VOLTS A.C. FROM MAIN SWITCHBOARD
PANEL IN THE ELECTRIC SHOP
USE SMALL BATTERY CLIPS
CURRENT BLOCK FIG. 2
NO. 16 LAMP CORD
NUTS
WASHERS
3/16" STOVE BOLTS
WIRES RUN THROUGH BLOCK TO STOVE BOLT BINDING POSTS
CURRENT BLOCK FIG. 3

Diagram of low-voltage distribution system

A 75-watt transformer connected to an a.c. supply source in the shop, makes low voltage accessible at all times. This voltage can be varied by use of switches as shown in Figure 1.

Voltmeters and lamps can be inserted in the transmission line as permanent features to check voltage and act as pilots to insure the line being in service.

This system has rendered efficient service for seven years with voltages ranging from 6 to 20 volts.

Since low-voltage transformers are replacing dry cells as sources of current for home and apartment-house uses, this system, by its very operation, teaches transformer uses as applied in the commercial field.

The current block which conveys the electricity from the transmission line to the tables is very simply and cheaply constructed, yet it is very efficient. It is shown in Figure 2.

The base is a 4 by 6-in. wood block. Bore holes at the desired points for the negative and positive binding posts, which are made of 3/16-in. stove bolts. Countersink the holes on the bottom of the block so that the stove-bolt heads will be below the surface and allow the block to rest flat. With a 3/16-in. bit, drill holes through the block lengthwise, connecting both positive and both negative binding post holes. Run one wire of the No. 16 lamp cord through the block to both positive binding posts and the other wire to both negative posts. Use washers on top and bottom, and tighten the binding posts in place.

A second nut is used on each bolt to secure the circuit wires that are fastened under it. Rivet the tops of the bolts over the nuts so that these may not be lost.

Small battery clips are then connected to the other ends of the lamp cords as shown in Figure 3 so that they may be easily attached to or disconnected from the transmission line.

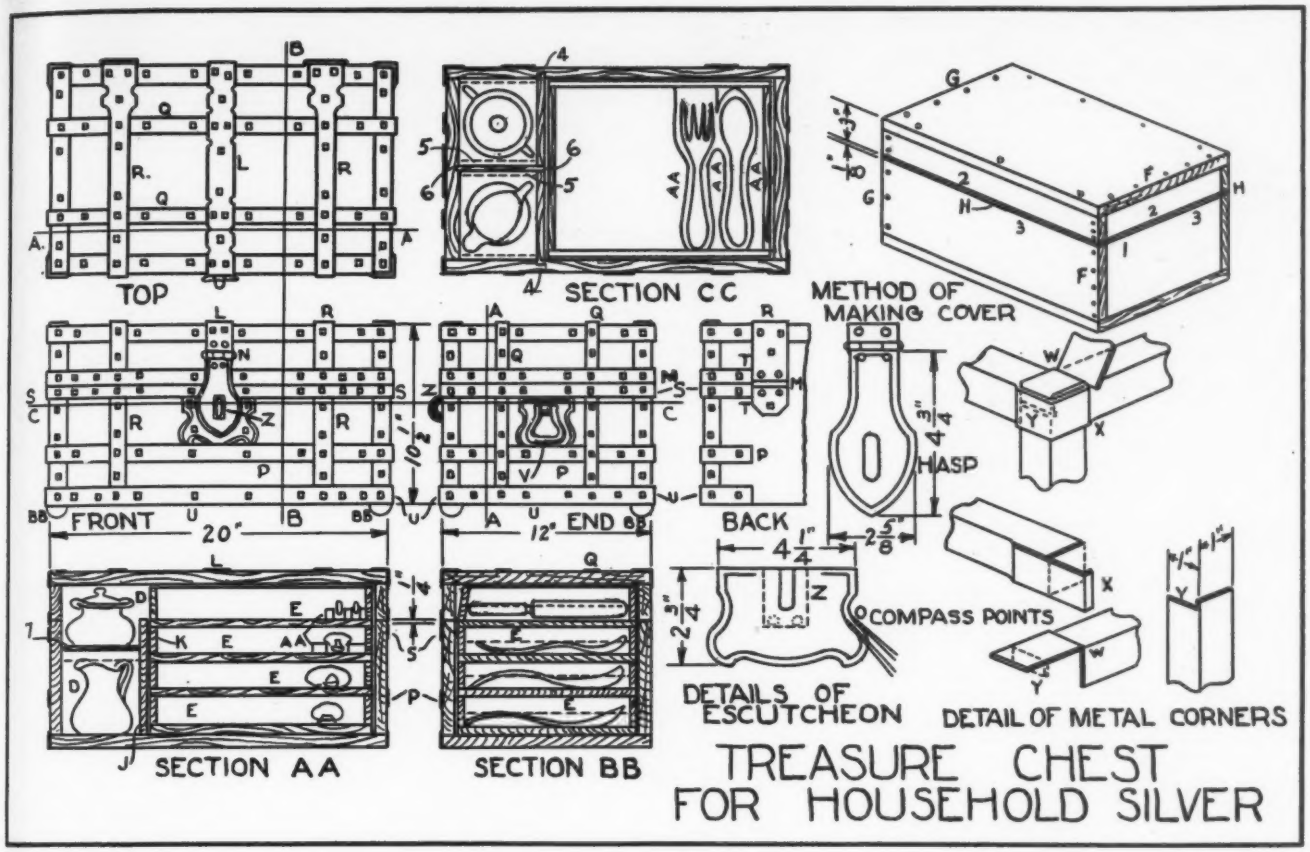
Current blocks with four or more binding posts may also be made so that several pupils may work at the same bench at one time if necessary.

TREASURE CHEST FOR THE HOUSEHOLD SILVER

Charles A. King, East Kingston, New Hampshire

The treasure chest described here will not be proof against burglars, but it offers a receptacle for the usual family silver. The chest may be made larger or smaller as needs may suggest.

To begin, assemble the silver which the chest is to contain. Next, decide upon the size of the compartments *DD* which are to receive the tea or water service, if these or similar pieces are to be placed in the chest. Also, decide how much tray room *E* will be required to accommodate the tableware and



Details of treasure chest

other small pieces, with allowance for future expansion.

While the chest may be made of whitewood, red gum, mahogany or any wood desired, oak seems the natural wood for a treasure chest. The oak used may be either plain or quarter sawed. The former will answer the purpose very well but it lacks the beauty of the latter. Red oak, too, may be used if desired, as it works more easily than white oak, though the latter has the more beautiful grain.

Square up the two sides ¾ by 9¼ by 20 in., and two ends ¾ by 9¼ by 10½ in. The width, 9¼ in., allows ¼ in. for making the joint between the cover and the body of the chest, and permits the chest to finish to a height of 10½ in. Fasten the parts together with either 6d finish nails as at *F*, or with No. 8 by 1½-in. screws as at *G*. The latter is preferable, as screws hold far better than nails and the heads will be covered by the metal strapping. The two pieces for the top and bottom should be ¾ by 12 by 20 in. The bottom may be made of whitewood if desired. The cut *H* should be located at the corners before the rim is fastened together and care taken that the nails or screws will not interfere with the saw while making this cut and fitting the cover. Fasten the top and bottom with 6d finishing nails.

Set heads well below the surface and smooth and sandpaper all surfaces of the chest except the bottom. With a sharp gauge, mark line 2 on all four sides of the box, and mark 3, ⅛ in. below it, using the gauge from the top. With a smooth-cutting ripsaw, cut between lines 2 and 3, being careful that the sides of the saw are square with the surface of each side of the chest to insure a square cut. Fit the cover to the body of the chest with a sharp jackplane or jointer, being careful that the corners are not broken off by planing. This cutting may also be done by a circular saw, which will result in greater accuracy and a considerable saving of time.

Next, cut a piece of wood for the partition *J*. This will be ¼ by 7 by 10⅞ in. Locate and cut grooves in the sides to receive this partition as at 4, making the groove 4½ in. from the left end. Cut partition 5, ¼ by 7 by 4¾ in. Assuming that four pieces are to be placed in the compartments *D*, cut grooves 6 to receive partition 5, where their sizes will be best served. Fasten all with brads. Cut four cleats ¼ by ½ by 4½ in., shown by dotted lines, to support two shelves (7) (plywood preferred). These are to be ¼ by 4¼ by 5 in., if partition 5 is placed in the center; otherwise one shelf (7) should be cut ¼ in. short of the distance between 5 and each side of the chest to allow for the lining. Bore a ¾-in. finger hole through each shelf 7 so it may be removed easily. Verify these dimensions and adapt to suit contents.

Make four, or as many trays as may be desired, of ¼-in. wood. These may be of varying depth to suit contents. Make them with square butt corners, fastened with No. 18 by ⅞-in. brads. Four trays 2⅛ in. deep inside or 2⅜ in. outside with the lining should just fill the space. To make these, a bottom ¼ by 10⅛ by 13⅜ in., two ends ¼ by 2⅛ by 9⅝ in., and two sides ¼ by 2⅛ by 13⅜ in., will be required for each drawer. The length of the tray depends upon the location of partition *J*, and the thickness of the felt or velvet used for lining the box and covering the outside of the tray. In all cases, the trays should fit loosely so that they may be lifted out easily. Bore two finger holes through each end, or glue or tack tapes at *K* at each end as preferred, to make the lifting of these trays easier. In making the trays, note that the upper tray front slants back to allow the cover to close.

The straps may be made of soft iron or of copper about 22 gauge in thickness though 1/16-in. sheet lead also may be used, as it is much easier to be worked. A piece 1 in. wide by 13 ft. long, and 1 piece ¾ in. wide by 16 ft. long, and 1 piece 2 in. wide by 10 ft. long will be required for these straps. The hinge straps will require pieces 2 by 42 in. cut to design and fitted to 2-in. iron butts, and later fastened to butts and wood with flush countersunk screws as indicated at *M*. The hasp strip *L* is 1½ by 18 in. It also must be cut to design and fastened to 1½-in. iron butts and wood, with screws as at *N*. One escutcheon plate, 2¾ by 4½ in., and two handle plates 2¾ by 3½ in. should not be made until the straps are in place, for they fill the space between them. The latter should be cut to design and embellished, if desired, by a slight groove made by using compasses as indicated at *O*. The hasp, 2⅝ by 4¾ in. should be made of ⅛-in. lead, shaped and embellished by the same method. Fasten the strips as they are fitted with No. 17 by ⅝-in. brads, driving them where another strip will cover the holes. Touch all corners with sandpaper or emery cloth to remove the burr.

Fit 2-in. corner pieces, front, back, and end pieces at the top corners, following the detail in making the cuts. Next, fit 1-in.

strap piece *P*, and ¾-in. pieces *Q*. Hinge straps *R* and hasp strap *L* should be fitted next, which involves the fitting of the butts *M*, hanging the cover and the hasp butt *N*. The ¾-in. wide strap *S* of the box should be placed ¼ in. or less below the cover joint, and extend around the chest to the back hinge at each end as at *T*, and the corresponding strip of the cover should be placed against it and fitted around the same way. Also the bottom 1-in. strip *U*. About 310 hammered-iron nails, will be required. These should be about ⅜ in. across the head. The nails and the two iron handles *V* may be purchased at any well-stocked hardware store. Drive the hammered nails as indicated, boring awl holes in the lower edge of the cover to prevent splitting.

After the straps are in place, with the smoothly rounded end of a piece of flat iron or steel and a light hammer, bend the outside straps into the corner as at *W*, at every cross of the chest. This may be done at times as the work progresses, especially at the corners. Do not strike the lead strapping with a hammer, unless a block of wood protects the lead, or use a light wooden mallet. The front and back straps will end where they lap around the corners as shown at *X* and *Y*. Fit the ⅛-in. hasp and staple at *Z*, cutting into strap *S* to receive the staple plate and fastening the escutcheon plate over it. The staple may be bought at the same time the nails and handles *V* are purchased. Rivet the hasp to the butt *N*. Fasten handle plate, and handle *V* by a bolt which is part of the handle and extends through the end of the chest.

Stain the wood of the chest any desired dark color, working it well under the straps and finish with three coats of shellac well rubbed with No. 4/0 sandpaper. It will be well to spread flat black, or gunmetal color upon a piece of lead, allowing it to dry partially, and wiping the color from the high places which will bring the gray of the metal out as high lights. After the finish has thoroughly dried, give two coats of wax and polish, allowing at least a day between coats.

While the finish is hardening, line all interior surfaces with felt or velvet. Cut the lining carefully to fit every part exactly. Use liquid glue in gluing the lining; spread it sparingly and keep the hands clean. Work it well into the corners with a dull case knife or a knife-edged stick, being careful that the glue does not appear on the surface of the lining.

The trays should be lined inside and covered outside. Although ⅜ in. is allowed for the lining and for clearance of the trays, the result should be tested carefully to insure that the trays may be removed easily.

Place the contents of the chest in their permanent positions. Fit pieces of wood (*AA*) of suitable size and shape around them to hold them snugly but not tightly, and cover all but the bottom of each piece with lining. Cut a piece of lining from the tray bottom where each piece *AA* is to rest and glue the piece firmly in place. It may be fastened with small brads driven through the bottom if necessary.

The tea service and the tray contents may be held in place by pads as simply or as elaborately designed as desired. if all pieces are not held firmly. Usually the silver tray of the tea set, if one is used, may be laid over the top tray of the chest.

Place rubber chair tips or "domes of silence" at the corner of the bottom at *BB* for feet. Give the outside of the chest a final going over with wax, then put a quaint iron padlock in the staple and the chest will be ready for use.

A BLACK-LINE PRINTER

Leslie H. Murphy, Ottawa, Kansas

In order to be able to make black-line prints at any time, it is necessary to use electric lights. The apparatus described herein, was designed for a printing frame with an 18 by 24-in. glass. Figure 1 shows how to construct a black-line printer.

The reflector may be made out of bright tin with soldered seams. This can be done in the sheet-metal shop. It may also be made out of 3-ply panel or heavy cardboard. If the panel or cardboard is used, it must be painted with aluminum. If the panel is used, it can be put together with glue and brads. When the cardboard is used, the edges should be taped with 2-in. gummed tape.

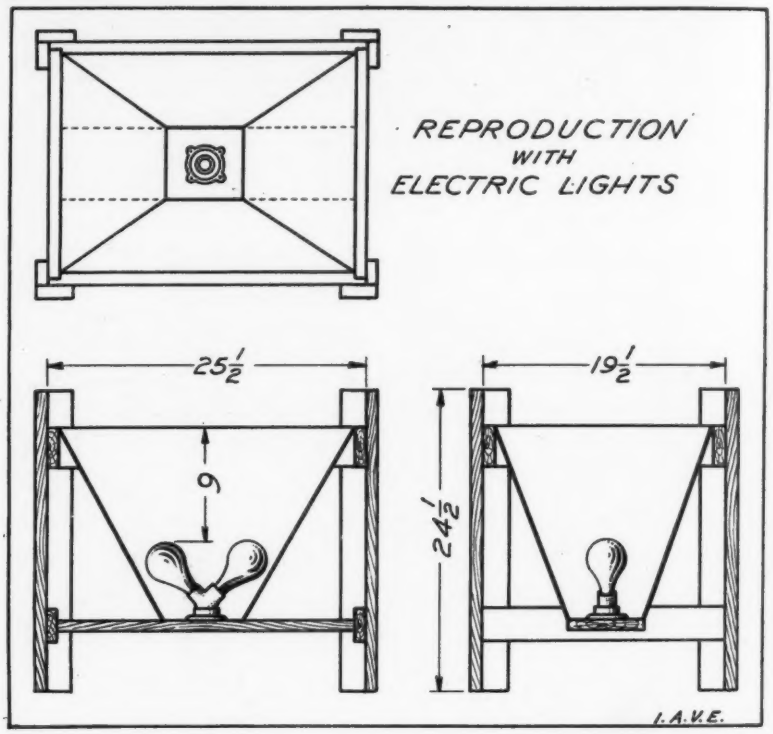


Fig. 1

Many different experiments were made to determine the right kind of bulbs and the proper time of exposure. All the experiments were made on black-line paper. The bulbs that made the best prints and took the least time of exposure were photoflood bulbs, using two 750-watt bulbs. The time of exposure was 4 minutes and 30 seconds.

In developing black-line prints, a special developing salt is used for each brand of paper. This is mixed with a certain amount of water, and is then applied to the print with a sponge. Another sponge, dipped in clear water, is then used to wash off the print. If the print has been underexposed, the background will be dark, and if overexposed, the lines will be light.

CHIPPING AND FILING

C. R. Lindstrom, Peru, Nebraska

Projects designed especially to teach chipping and filing on metals are unusually hard to find. As a result, most of the teaching of this phase of general metals is incidental to the other important phases. Such being the case, many students of metals obtain only a casual grounding in this common but very important art. Such a condition can be avoided by selecting a project that teaches the important elements of chipping and filing. The bench stop is such a project. A typical job sheet of the project follows.

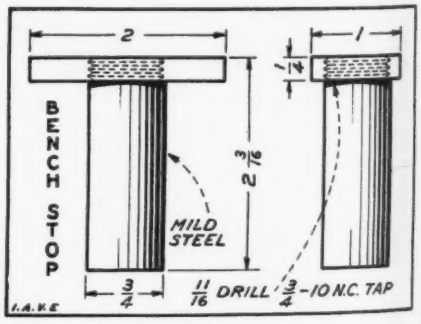
Job Plan of Bench Stop

Information

The bench stop is an unusually good project for the teaching of most of the common operations involved in chipping and filing of cold metal. It is a project that is useful in the school shop and, of course, is not expensive.

Materials

¾-in. round mild steel stock
1 by 5/16-in. mild steel strap iron stock



NOTE: In the final product only 2 to 3 in. of each piece of stock is used. It is not advisable to cut the stock to length when you begin the project, but rather to have sufficient stock for holding in the vise.

Tools

Hack saw and blade (24 teeth to inch),

center punch, ¼- and 11/16-in. twist drills, ¼-in. taper tap, ¾-in. stock and die, one rough bastard and one smooth-cut bastard file, micrometer.

Procedure

Note that the operations are placed in disarranged order. The student should attempt to designate the proper order by giving the numerical order in the parenthesis preceding each operation. Check with your instructor for the proper order.

(5) Tap threads in 11/16-in. hole.
(11) Finish to size with mill file (tolerance .002).
(7) Thread round stock.
(10) Rivet.
(8) Countersink.
(3) Drill lead hole.
(1) Get out stock.
(4) Drill 11/16-in. hole.
(2) Center punch for drilling lead hole.
(6) Rough cut to size with bastard double cut.
(13) Draw-file to polish top.
(14) Mike to tolerance.
(12) Polish and buff.
(9) Assemble.

PICTURE MARQUETRY

A. Leslie Carey, Emmerich Manual Training High School, Indianapolis, Indiana

Picture marquetry was started in the Manual Training High School last September as a club activity (one period a week), limited to ten upper classmen. At the beginning of the second semester, the membership was increased to twenty. Next year the club will be open to both boys and girls, making a club membership of twenty. At the present time, the list of applicants for membership in next semester's club will more than fill the club, showing that there is great interest in this sort of activity. There is a nominal fee to cover expense.

Picture Marquetry for the Amateur

Picture marquetry is the fitting together of woods of different color and grain, forming pictorial designs. This seems a difficult task at first glance requiring a great deal of patience. But there are some short cuts that have been worked out, so that any amateur may employ the method devised with excellent results.

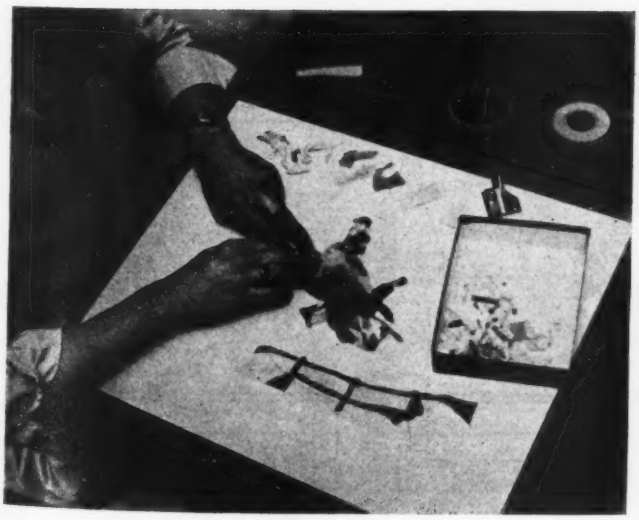
The basic idea in making a wood-veneer picture is sawing through all thicknesses of the veneer in a pad simultaneously. Experience teaches that if all the different pieces of wood needed to form one picture are taped together, and are all cut at the same time they will have to fit together.

The biggest problem a person interested in this hobby has to face is getting designs adaptable to wood pictures. Scenic pictures are easiest to start with. But our club has done all types, even character portrait studies. There are now several companies that have a complete line of designs, veneer, inlay banding, saw blades, and other necessary equipment and materials.

The first step in making the picture is tracing the design on the piece of veneer to be used as the sky or background. This piece of veneer should have a margin of about ¼ in. all around the actual size of picture as a working margin. A 1/28-in. veneer is used in preference to other thicknesses, as this keeps the pad thin and it is the one thickness in which most veneers can be obtained. Veneers should next be selected for grain and color to best portray various parts of the pictures. The grain should be laid in the

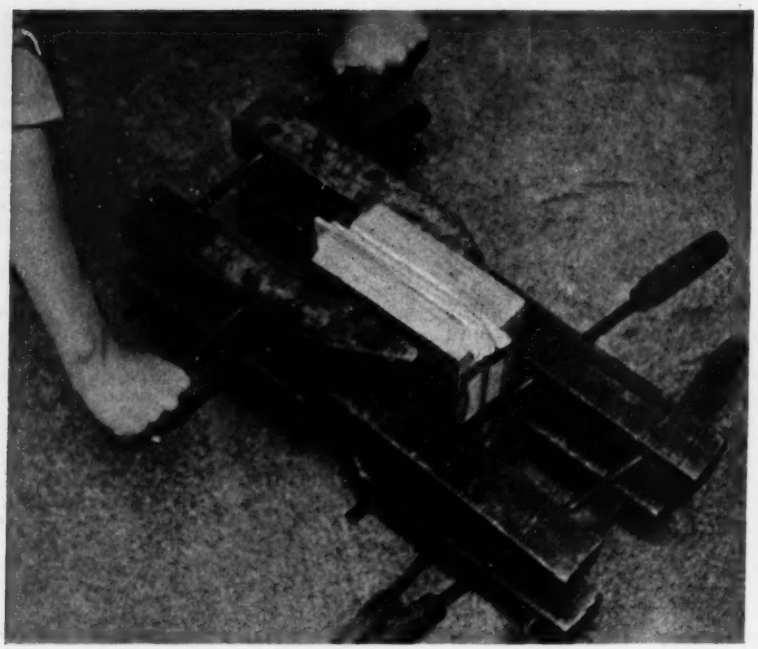
Building up pad

Tracing



Assembling

Sawing



Gluing

I. I. E. A. exhibit

direction which best brings out each part of the finished picture. A little experience and imagination will soon solve this problem. It would be extravagant to use a sheet of veneer the full size of the picture for each color needed in a picture. It would usually make the pad too thick.

It is better to use a patch method covering only the particular parts of the picture with the color and the kind of wood to be used for that specific part. It is not always best to make separate patches of each small detail. Sometimes a patch large enough to cover all the parts of the picture to be made of a single kind of veneer may be used. This will cause some waste, but it will be impossible not to waste some veneer. After the veneers have been selected for each part of the picture, they should be taped to the back side of the background veneer, usually a sky horizon. After covering each part of the picture, be sure to tape all edges of the patch securely to the back of the picture. Transparent scotch cellulose tape is excellent for this purpose. When all patches are taped in place, the pad is ready to be sawed.

The most important things to remember in sawing are:

1. Use the slowest speed possible on a power jig saw from 500 to 600 r.p.m.

2. Use saw blades of the right size. Jewelers' saw blades of 4–0, 6–0, and 8–0 sizes are best.

3. Staying on the line is quite essential, but a little variation is permissible as the same variation will be cut through the entire thickness of the pad and the saw cuts will match.

4. Cut straight-line joints with a razor-blade knife. Sand to a perfect fit. This will avoid the width of the saw cut showing in the finished picture.

Lay the pad face up on the saw table and start sawing into the pad from a place where the design is in direct contact with the margin line. At this point, certain parts can be sawed out of the picture. Saw completely through the working margin and in this way you will make it possible to get another saw cut started into the body of the picture. Do this until you have sawed every line of the picture. The pieces will resemble a jig-saw puzzle.

Assemble the picture as you would a jig-saw puzzle, using only the pieces intended for the various parts. No inlay scraps should ever be disposed of until the picture is completed. Tape all the pieces together with scotch cellulose tape. Apply the tape to the top side of the picture or it will appear in reverse on the finished picture. When all the parts of the picture are in place, the picture should be trimmed down to the margin line with a steel straightedge and razor-blade knife. The border should now be prepared in strips of the required width and length to frame the picture. These strips should be cut straight and fit to the edges of the picture and also taped. Inlay strips may be inserted in between the border and the picture. Miter the border to fit the picture and tape the border to the picture. When using inlay strips, tape them to the border strips before cutting the miters.

The picture, completely taped together, can now be handled as any veneer job. Glue the picture to a piece of ¼-in. fir plywood. Back the plywood with a sheet of veneer to prevent warping of the finished picture. Glue the face and backing to the plywood across the grain of the two plywood faces. Two flat boards and a number of hand-screw clamps will serve as a press in gluing. Insert paper between the two flat boards and the face and back veneers to avoid sticking together.

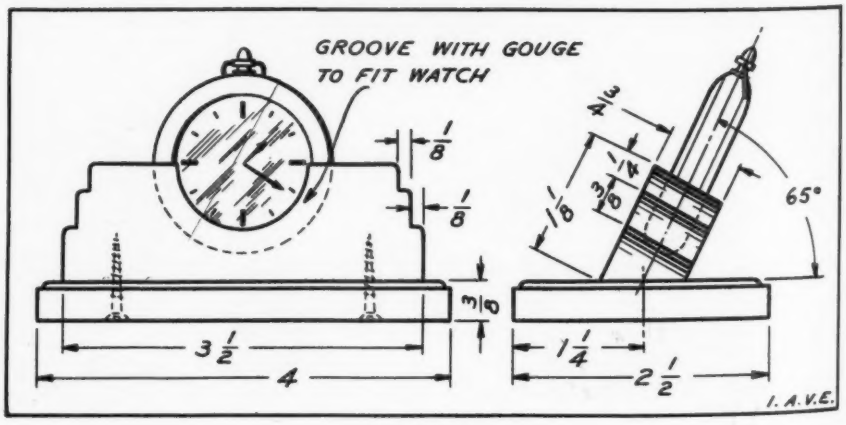
Sand and finish as you would any piece of furniture. A dull finish will prove more satisfactory, as there will be fewer reflections.

WATCH HOLDER

Donald Towle, St. Johnsbury, Vermont

How to use up the wood in the scrap box at the end of or during the school year on a small worth-while project is always a problem. It may be solved by making the watch holder described herewith. This holder, with its solid bottom, will not readily tip over or fall on its side. The two pieces of wood in the project hold the watch in an upright position so the watch can be readily seen.

The making of the base should offer no problem. It consists merely of an oblong piece with a chamfer on all sides. The upright member is laid out, cut to shape, and sanded smooth. The groove which the watch fits in is laid out to the correct size and cut out. A groove ⅜ in. deep is then cut to fit the



Watch holder

watch. Next, the bevel is planed on the bottom edge, and the watch holder is glued in place. A piece of felt is then glued to the bottom of the holder. Any type of finish may be applied, varying, of course, with the wood that is used.

THE SILHOUETTE IN LINOLEUM-BLOCK CUTTING

May Lillian Lampe, Weehawken, New Jersey

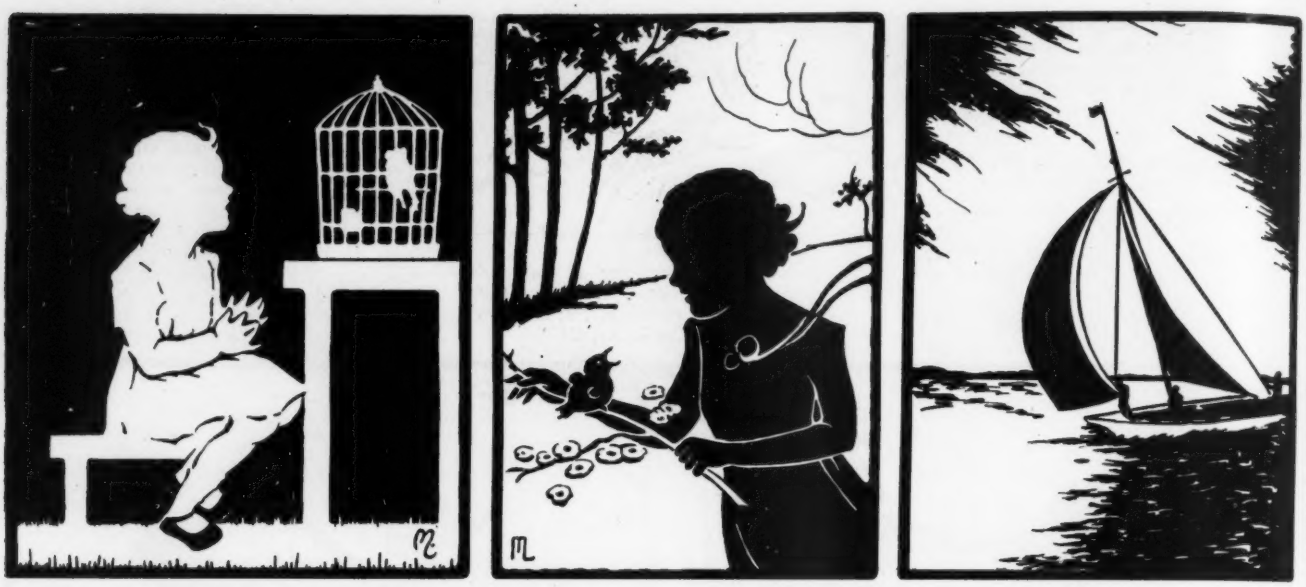
The silhouette provides a definitely individual way of expressing an idea. These little black form pictures are seen in art everywhere, and yet hardly anyone gives a second thought to their origin.

Stag hunt, a cave drawing of thousands of years B.C. (from Cyclopaedia, Universal History of the World, Jones Bros. Pub. Co., Cincinnati, Ohio)

In 1759, a Frenchman, Etienne de Silhouette, distinguished himself by creating this new art using a simple black profile obtained by projecting a shadow on a sheet of white paper. He got the inspiration while studying the outline of a friend seated opposite him at dusk, and soon the walls of his apartment were decorated with the profiles of his friends — portraits in black.

Silhouette was quite a character. He was born in Limoges, France, in 1709. As a young man, he traveled extensively and attracted wide attention by his historical and political writings. In 1759, he was named comptroller-general and minister of finance through the influence of the Marquise de Pompadour.

Designs for silhouette block cuts by May Lillian Lampe



Designs for silhouette block cuts by May Lillian Lampe

The idea of the form pictures, cutouts in black paper pasted upon white cardboard, quickly became popular in France. Then Germany, England, Italy, and other countries followed suit, using the new idea commercially. In 1800, the silhouette was introduced into America. The early Harpers' magazines show them depicting the full figure instead of only the head. Scenes of trees, birds, flowers, and coaches were beautifully executed. During the revolutionary and civil-war days, the hoop-skirt contour portrayed the spirit of the times.

Egypt, as far back as 3000 B.C., produced accurately carved figures in black relief. We call these pictorial symbols or expressions of a language, hieroglyphics or ideographs. Certain animals and birds were regarded as an incarnation of the deity. The hawk, the ibis, the vulture, and the phoenix were birds used to represent the deity, as were also the cow, the ram, the elephant, the cat, the ape, the crocodile, the dog, and the jackal among the animals. The sacred beetle and the lotus flower also were depicted in Egyptian art.

When a new decorative form is introduced, or a new style such as Silhouette produced becomes prevalent, it is natural to assume that it has been derived from somewhere. With the Egyptians, however, no one can state the origin of their art. For ages, without guide or precedent, they gave us examples of art which have never been equalled. With limited tools, they carved whole groups of individuals, scenes of harvesting, the killing of a sacrificial animal, and herdsmen crossing the Nile with their animals. Some of these black silhouettes, elaborately embossed and countersunk in stone and granite, date back to 2650 B.C. The workmanship of these early Egyptians astounds the modern worker. The edges of the figures and inscriptions that they delineated are as sharply defined after the vicissitudes of forty centuries as though they were the work of yesterday. Such is the perfection of their inscriptions that they may be regarded more as engravings than as sculptured representations.

Today some of our foremost newspapers in the country are using silhouettes on the theatrical pages, and in poster and general advertising work.

Many schools in America are using silhouettes for block cutting. With masses of solid black, a block design has characteristics no other method accomplishes. The outline, however, because of the lack of detail, must be correct.

For a change from the black on white, try *reverse silhouettes*. These, with their white-on-black background, will have a tendency to make a figure appear larger, but the illustrations will be just as effective.

Try taking some pictures of children at play, action pictures showing a child chasing a butterfly, teasing a cat, bouncing a ball, or climbing a tree. These may be turned into delightfully charming block cuts. Be a modern silhouettist. Get some real snap to your sketches, and while designing a modern linoleum block, remember the debt of gratitude we owe to Etienne de Silhouette.

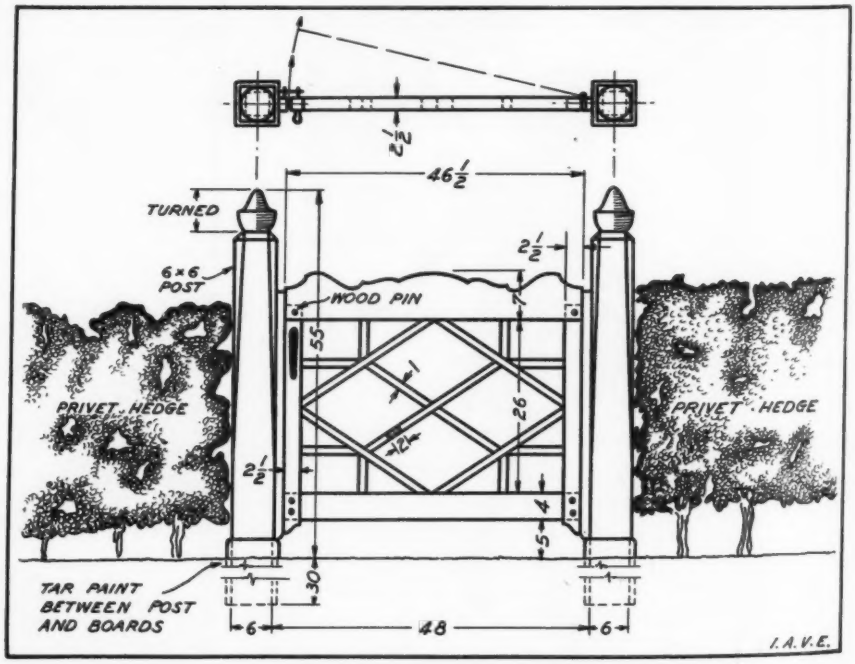
GATE

J. E. Ray, Stout Institute, Menomonie, Wisconsin

An interesting gate adds interest even to a service entrance. During the colonial days, the main entrance was always graced with a gate and fence of unusual design. The gate shown herewith has been the cause of many complimentary remarks.

Gates of this kind may be made of various materials and either stained or painted, depending on the surroundings. The posts may be made of cypress. If they are made of pine, the part that goes into the ground should be creosoted to prolong their life.

The top rail has several freehand curves which may be altered to suit the taste. The handle should be hand made of wrought iron



Gate for hedge by J. E. Ray

with the hammer marks showing prominently. The iron should be treated for resisting rust. The stiles of the gate are mortised and tenoned and pinned.

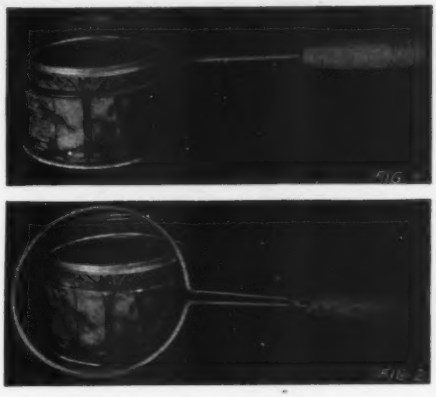
The height and width may vary, but the width should be in proportion to the height. The privet hedge and gate make a happy combination.

MALAY DAGGERS

Gilbert S. Perez, Superintendent of Vocational Education, Bureau of Education, Manila, P. I.

(For illustrations see pages 219, 220, and 18A)

Students who would like some unusual projects in wood carving and ironworking will find it possible to add an imitation Malay dagger to their collection. The handles of these daggers and their sheaths are of Philippine ebony or of teak with silver trimmings, but oak or walnut may be substituted. The Capiz dagger handle is the only survival of Indonesian art in the Philippines.



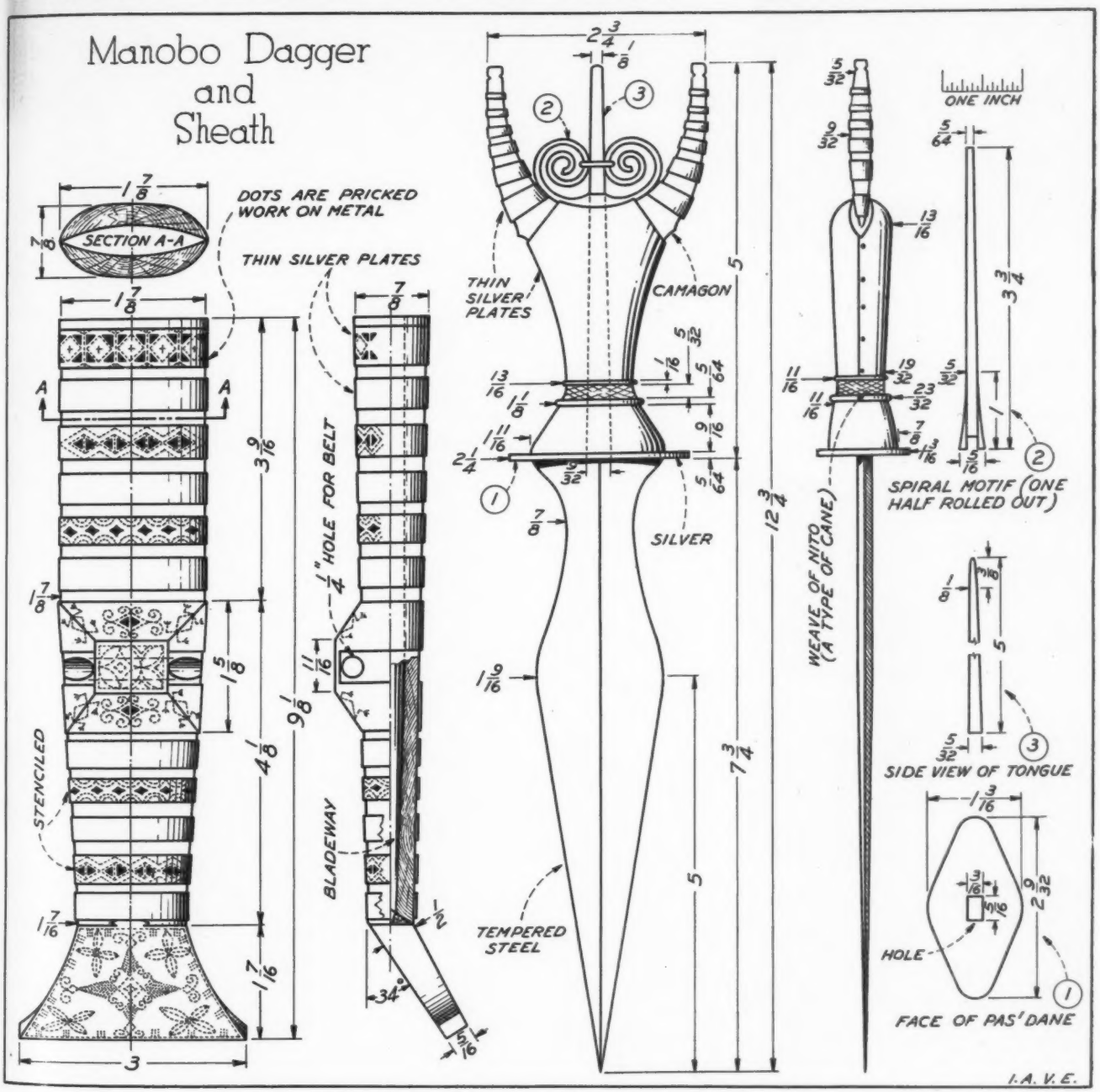
Handle for camping saucepan

KINKS FOR THE OUTDOOR CRAFTSMAN

William L. Hunter, Iowa State College, Ames, Iowa

The writer is an ardent lover and frequenter of the woods, rivers, lakes, and camping areas which the people of the United States are only beginning to cherish. There are opportunities for tying up industrial-arts activities with the recreational life of Mr. Average Citizen.

The following are a few of the kinks and devices which have served the writer many and many a time and which have likewise been acclaimed by others for their worth and serviceability.

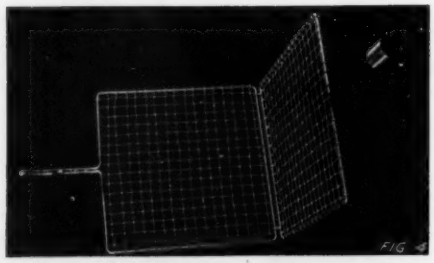


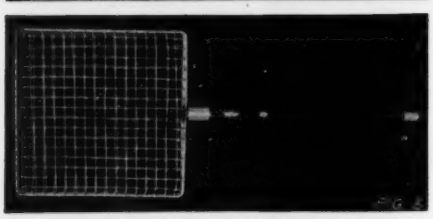
(For illustrations of other Malay daggers, see pages 220 and 18A)

When the lady friend of the household finds the outside of her nice new shiny saucepan besmirched with grime and soot, naturally she isn't so enthusiastic about the next picnic. And neither are you if she lovingly prevails

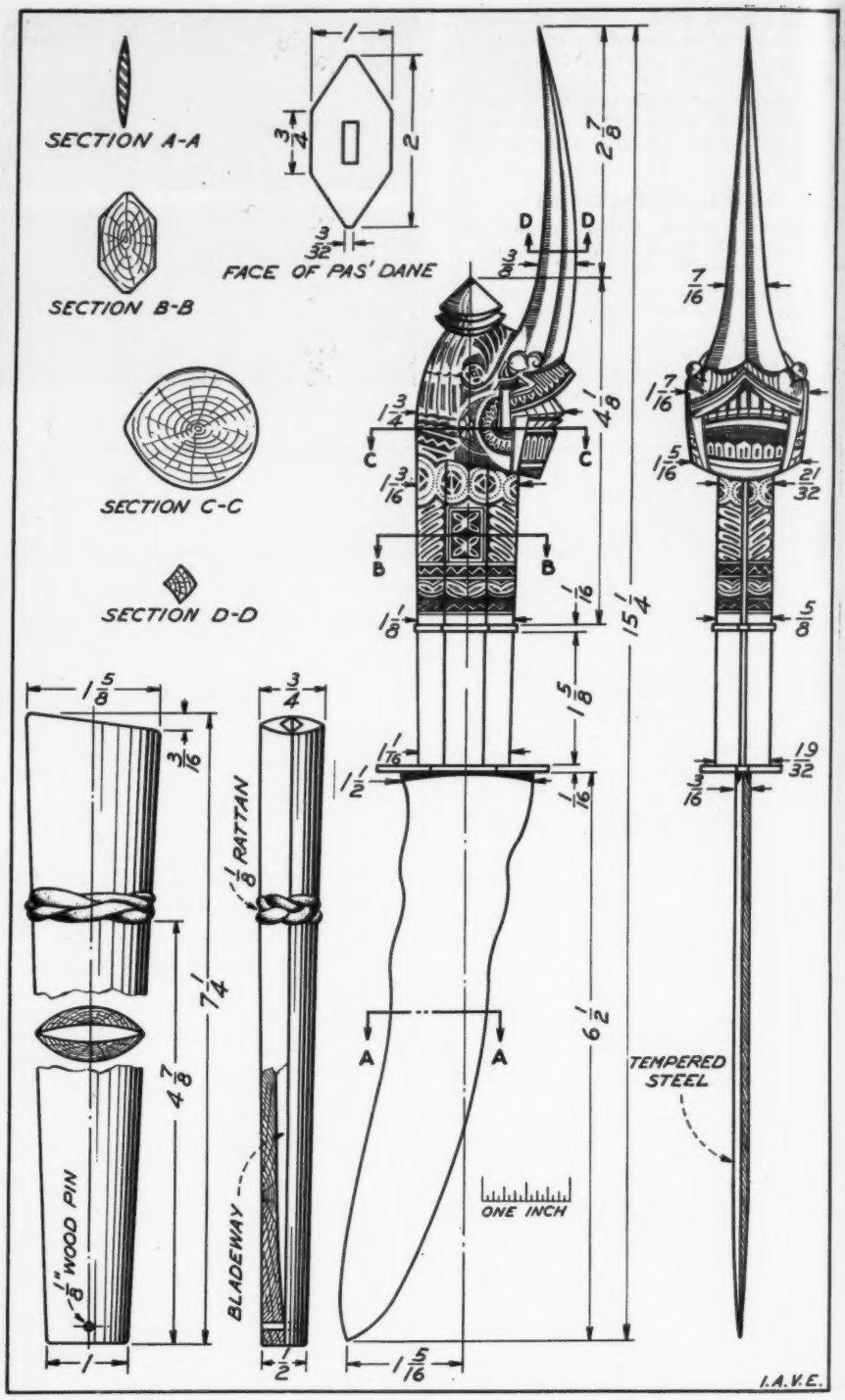
Fig. 3. Under-water illuminator

upon you to restore the pan to its former luster. This difficulty is entirely obviated and domestic tranquillity maintained if one improvises a removable handle for a standard-size coffee container. Figures 1 and 2 are self-explanatory. After the eggs or potatoes or other articles of food have been boiled the container is thrown away and the handle kept for the next outing.





Steak broiler



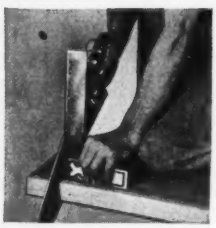
Panay dagger and sheath (*For article and other illustrations, see pages 219 and 18A*)

Those who are on the water long enough sooner or later drop something valuable overboard. Hunting for something on the bottom of a lake is as difficult as locating an honest fisherman unless one uses such a device as is illustrated in Figure 3. Simply load up your old trusty flashlight with some new batteries and put it in a fruit jar of appropriate size. Seal the jar and if necessary weight the jar so that it will go to the bottom. Of course, if the area of water is large, one should instantly mark the spot with a float where the lost article goes overboard, thus facilitating the search. At night, providing the water isn't too muddy, the bottom of the lake is quite plainly visible with such a device.

Steak fries out in the open are not nearly as widely practiced as they some day will be. Good tender, juicy sirloin steak or hamburger cannot by any means be cooked as appetizingly as it can by a grille over a fire of hot coals. Such a device or grille is shown in Figures 4 and 5. The pipe is ¼-in. black iron and may be provided with a

(Continued on page 18A)

Pre-View of Shop Hints from Disston Saw, Tool and File Manual



Here are three illustrations from the new edition of the Disston Saw, Tool and File Manual. Jig for cutting mortise slots in mitred corners for inserting veneer strips to make feather joint (*top*). Trimming inlay picture (*center*). Making perfectly square end cut (*bottom*). Many valuable shop hints like these are shown in 48 pages of text and pictures.

Instructors who have used the Disston Saw, Tool and File Manual in school shops, know its worth. Now this handy book is completely revised!

Forty-eight helpful pages tell you how to use saws and tools for easier, better results... make an ideal text book for students in your shops.

Any instructor in vocational education can get this up-to-date edition *in any quantity* . . . at merely the cost of printing: 5c the copy. Order yours today! Or send for your free sample copy.

HENRY DISSTON & SONS, INC.
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Fig. 7. Landing net

jointed handle so as to take up little space in transportation. Also the long handle keeps one from burning his hands. Cold-rolled ¼-in. or 3/16-in. rod may be used for the frame of the grille portion. Standard ¾-in. mesh hardware cloth may be used for covering the frame. Figure 6 shows some of the grilles in use.

The industrial-arts fisherman will need a landing net (see Fig. 7) so that his veracity will not be questioned the next time a big one gets on his hook. The handle is made of a section of a cane pole, the round frame is made of 3/16-in. cold-rolled rod, and the net itself is purchasable for a few cents from standard supply houses. A piece of brass tubing over the end of the cane handle makes it more durable.

An old, old kink but one that is too little used is that of storing one's license, matches, and any other small necessaries in the butt of one's gun (see Fig. 8). When the plate is removed from the stock of most guns one finds a hole about ¾ in. in diameter which provides a small storage space and thus one is never embarrassed by finding that his hunting license has been left at home in his "Sunday-go-to-meeting" trousers.

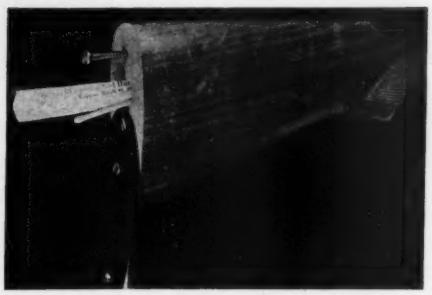


Fig. 8. Hunting-license receptacle

MAKING A SIMPLE COMPASS

Hugo L. Sutor, Charles Sumner Junior High School, New York City

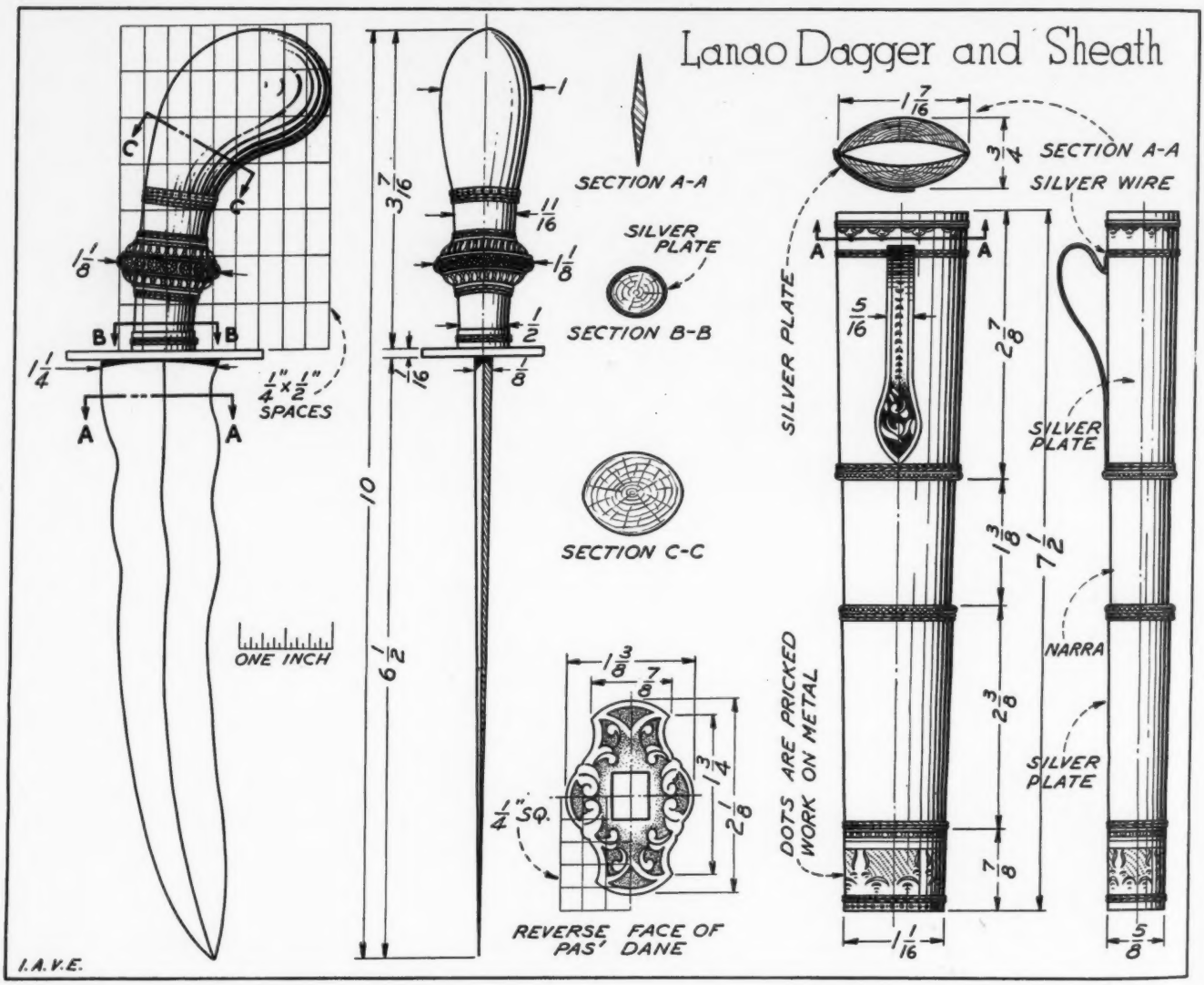
This is a fine project for beginners in electricity. It makes the teaching of magnetism more effective because of this practical application. Such factors as neatness, the elementary principles of planning, designing, and drawing also enter into it, and, in a small way, the adaptability of waste materials for other uses.

Motivation is easily obtained with a talk on the compass giving a brief history, its use and necessity in the wilderness and at sea. Showing and allowing the boys to handle a boat compass and pocket compass will create an eagerness to begin at once.

The material consists of a piece of wood, a phonograph needle, and a length of watch spring, all of which are easy to obtain.

The base is in the form of an octagon constructed within a square. To prevent waste and to provide practice in laying out work, it is best to have a preliminary drawing made

(Continued on page 20A)



(For article and illustrations of other daggers, see pages 219 and 220)

A New Trend
IN SCHOOL SHOPS

There is a definite trend toward *smaller, more compact low-cost* power tools in U. S. School Shops. In this, schools are following industry — where low cost industrial power tools are revolutionizing many production set-ups.

This development should be of great interest to all school executives. It not only means that school shops can be equipped and maintained at a fraction of former costs — but assures students training on machines that they can use in both industrial and home shops after graduation. For the full story in complete detail — together with descriptions and prices on the entire line of Delta tools, send for 1939 catalog.

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Standardize on STARRETT TOOLS

(Continued from page 18A)

on paper. Chamfering, sandpapering, and finishing with a rub of shellac and oil gives the piece a neat, clean appearance. Lettering the points of the compass is accomplished with the use of steel letter stamps but, of course, they must not be driven down too hard.

The phonograph needle was found to make the best pivot, although it must not be one that is too worn, for if it is, the needle will not swing properly. It is driven flush through the center of the back.

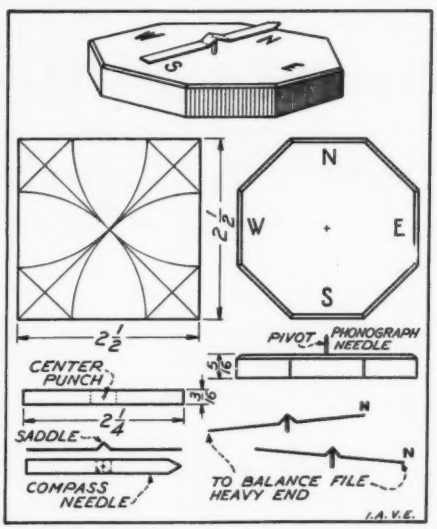
The magnetic needle is a piece of watch spring. A small area at the center is heated to remove the temper for center punching and the bending of the saddle. Care must be used in heating so that the temper is not removed from the entire piece in which case it will be necessary to retemper the needle in order that it may retain the magnetic properties given to it. It may be necessary to experiment with the point of the center punch so that the depression left by it will enable the needle to swing without effort, almost frictionless, and also remain perched securely on the needle. Punching through the material must be guarded against.

Magnetizing the needle is done either with a strong electromagnet or by rubbing it with a permanent magnet, using alternate poles. The north pole may be located by placing the needle on its pivot and allowing it to come to rest, or it may be determined by using a magnet with identified poles. When north on the needle is located, it is provided with a distinctive point for future identification.

Balancing the needle is the final operation. Much trouble can be avoided by using extreme care in placing the center punch.

Method of Procedure

1. Heat center of needle to cherry red. Do not let it spread to ends.
2. Indent center with a center punch.
3. Bend saddle using depression as the center.
4. Magnetize needle by stroking with a horseshoe magnet, using north pole for one end and south pole for the other.
5. Place needle on pivot. North-seeking pole will point north. Cut point on this end for future identification.
6. To balance, remove surplus on heavy end.



A simple compass

Answers to Questions

FLOOR FINISHING

1060. Q.: The present finish on the floor of our home-economics room is wax. It shows dirt, foot tracks, and dishwater marks. Can you tell me of a finish that would withstand a lot of hard wear? — *C. A. M.*

A.: Scrub the floor thoroughly with a solution of Oakite or Tromete (tri-sodium-phosphate) cleaner, in the ratio of one-half pound per ten-quart pail of water. After mopping up with clean water, let dry two days with heat, and then use a power sanding machine to get a new surface. Do not try the short cut of sanding the floor first, as this would drive the wax in deep enough to make a permanent mess of any finish that may be put on afterwards. Write to the American Crayon Co., and they will supply you with a brush-on finish of the sealer and final-coat type which will penetrate the wood, seal, and then level up to a good tough and practically wearproof finish. For ordinary cleaning thereafter, the floor needs mopping and then a power buffing with steel-wool pads. This is the only type of finish which I specify for gym, kindergarten, shop, or home-economics floors.

Personal News

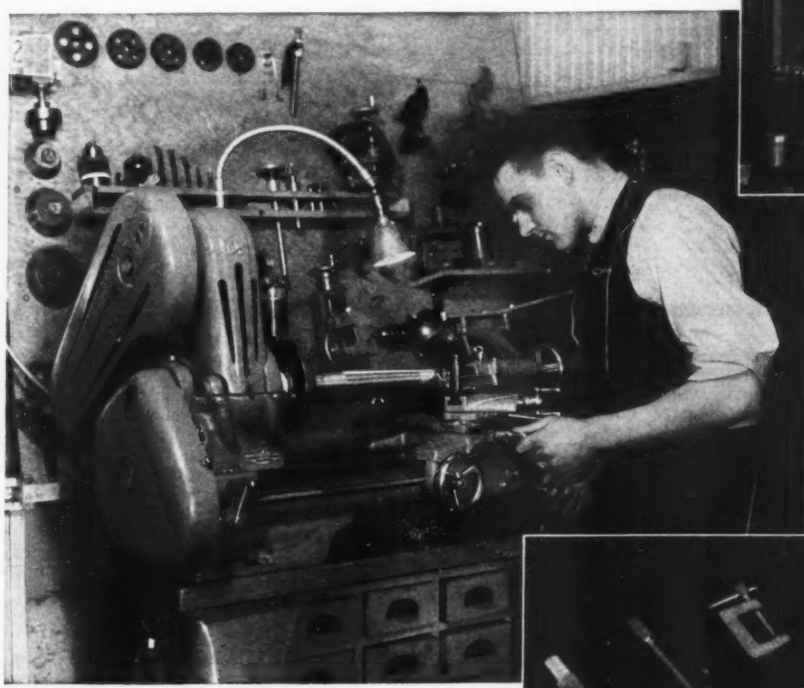
♦ PERCY HOWELL has been added to the staff of the Hamtramck, Mich., Vocational High School as a teacher of machine shop and related subjects. Additional classes, in these subjects, became necessary because of the increased demand for technical courses.

(Continued on page 22A)

Manhood in the Making

PRECISION PLUS RUGGED STRENGTH NEEDED HERE

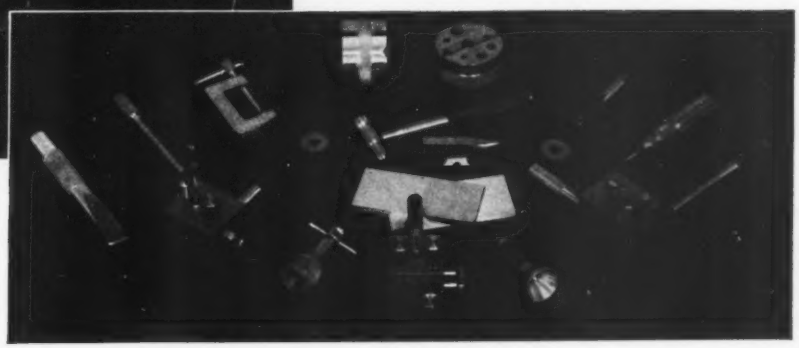
With universal recognition now of vocational education's importance, educators are studying shop equipment more carefully than ever before. What will best fit the student for the modern industrial world? Can we provide a well-rounded course with a limited equipment budget? Will this machine tool be safe — can it stand the punishment of inexperienced operation? Rapidly increasing numbers of schools are finding the answers to these and other vital questions in modern Atlas Equipment.



LOW COST SHAPER INSTRUCTION

Many shops, for the first time, are now able to give complete metal shaping instruction, thanks to the new Atlas Shaper. Priced at only $215, complete with safety guards less motor, this machine has the performance features of large expensive shapers.

It handles all work within a 7" stroke. The drive is the standard bullgear type powered by V-belts from motor to spindle. There are four speeds between 45 and 200 strokes a minute, and five surface feeds in either direction. It runs from a ½ H.P. motor.



COMPLETELY MODERN LATHES

If you are preparing your students for apprenticeship in a modern tool room or shop, you naturally want lathe instruction to include every operation on a modern lathe. Here again, a large investment is not necessary. The new Atlas F-Series Lathes start at $99.75 — and now *power cross feed is standard equipment.* Complete V-belt drive, quick-change countershafts, compact controls, precision-ground bed ways, custom-built spindle bearings, back-geared power — are but a few of the many modern features.

These precision tools, jigs, and gears were all produced by high school students using Atlas Machine Tools. They give you an idea of the range of work handled by Atlas Lathes, Shapers, and Drill Presses.

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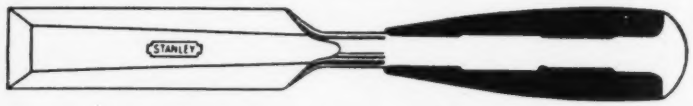
A "Boy Proof" Stanley Chisel is built to stay together. The handle surrounds the single piece of steel which extends from tip to tip, eliminating trouble due to lost or broken handles.

The blades are of the finest steel, tempered with newest heat-treating methods, producing keen cutting edges—edges that stay sharp. A chisel that fits the hand and has a fine balance. Write for catalog 34 describing the full line of Stanley "Boy Proof" Tools.



This cutaway view shows the everlasting construction of Stanley Chisels. The head, shank, ferrule and blade are forged complete — no mechanical joints. A blow struck on the head is transmitted directly to the cutting edge.

STANLEY TOOLS
Division of The Stanley Works
EDUCATIONAL DEPARTMENT, NEW BRITAIN, CONN.

(Continued from page 20A)

♦ GEORGE FERN, State Director Vocational Education, Lansing, Mich., will teach at the summer session at the University of Michigan, Ann Arbor, Mich.

♦ FRANK DALTON, Chief of the Division Trade and Industrial Education, Lansing, Mich., will teach at the summer session at the University of Missouri, Columbia, Mo.

♦ JACK MILLIGAN, Chief of the Division of Distributive Education, Lansing, Mich., will teach at the summer session at Columbia University, New York City.

♦ ARTHUR L. REAGH, Supervisor of Industrial Arts, Grand Rapids, Mich., will teach at the summer session at the University of Oregon, Eugene, Oreg.

♦ A. D. ALTHOUSE, Supervisor of Industrial Education, Detroit, Mich., will teach at the summer session of the State College of Washington, Pullman, Wash.

♦ RALPH RICHARDSON, industrial-arts instructor at Hartford, Mich., has constructed a four-harness weaving loom for use in his classes.

♦ W. G. BEHRENS is now Regional Supervisor of Apprentice Training for the U. S. Department of Labor. He was formerly teacher of automotive trades at the San Antonio, Tex., Vocational and Technical School.

♦ LESTER V. HILL, Richmond, Va., received the M.S. degree in industrial education at the University of Michigan in August, 1938.

Association News

♦ The eighth annual convention of the Indiana Industrial Education Association held at the Central Senior High School, South Bend, Ind., March 31 to April 1, 1939, was outstanding in point of attendance, organization and management. Credit for this is due the efficient general chairman, G. F. Weber, Director Industrial Arts Central Junior-Senior High School, South Bend, Ind., and his zealous coworkers.

Friday morning was spent by the members, who registered in large numbers, in visiting schools, places of business, and industrial establishments.

At the administration luncheon meeting, held at 12 o'clock noon, Friday, Dr. Frederick B. Knight, Director of the Division of Education and Applied Psychology, Purdue University, Lafayette, warned the members of the Indiana Industrial Education Association not to take education for granted. He called attention to a number of the vested interests which burden education and cautioned the teachers to keep themselves alert and wide awake and to plan their work for the welfare of the student and not for their own convenience.

Dr. Homer J. Smith, Professor of Industrial Education, University of Minnesota, Minneapolis, Minn., outlined the differences in viewpoints of those who are engaged in teaching and those engaged in the administrative activities of the school.

At the first general session, Friday afternoon, Frank E. Allen, Superintendent of Schools, South Bend, welcomed the visitors to South Bend. Dr. Frederick B. Knight again addressed those in attendance, outlining the needs of the students who attend our classes. Dr. Fred Strickler, Assistant Professor of Education, Teachers College, Columbia University, gave an overview of what confronts teachers and pupils in the schools of today. Dr. Homer J. Smith gave a 15-minute radio broadcast over Station WSBT-WFAM at 3:45 p.m., and Dr. H. B. Wells, President, Indiana University, gave a 15-minute broadcast over the same station at 5 o'clock.

About 450 attended the annual banquet held at 6:15 Friday evening. The master of ceremonies on this occasion was G. F. Weber, and the toastmaster, P. D. Pointer, Principal, Central Schools.

After the dinner, Dr. W. H. Johnson, Superintendent of Schools, Chicago, Ill., discussed "The Place of Industrial Education in a Program of Public Education." He pointed out that a broad conception of education must definitely show that industrial education occupies an important place in the training of modern youth and that industrial-arts courses must lay the basis for future vocational training.

Dr. Herman B. Wells in his address, called attention to the fact that the present state of affairs is one of fear and nerves; that the radio and the newspaper overemphasize the news to such an extent that public opinion quickly formed makes the information which is disseminated actually dangerous. He said that the news published in England and France in an entire week is not so vast as that which appears in the United States in a single day. He urged that we should overcome our fears and become dynamic rather than static. Pioneers were confronted by many problems which they solved as they went along. They removed the physical frontier. We must grapple with and solve the problems that the present frontier places before us.

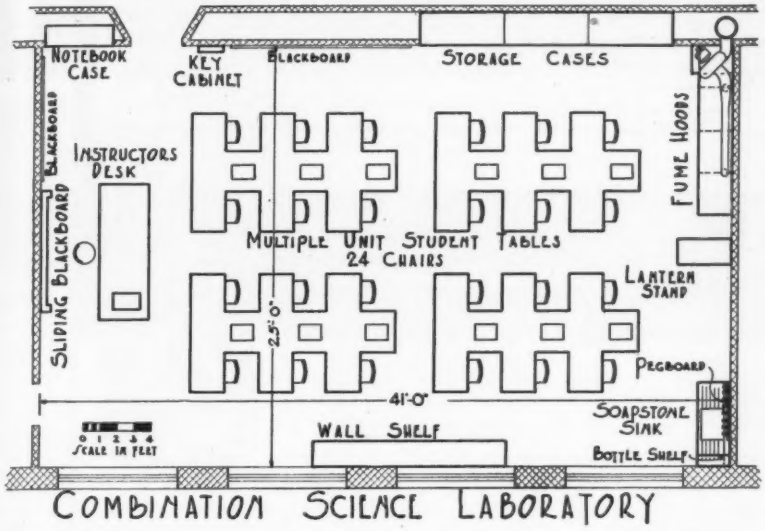
At the end of the banquet, 150 prizes that were contributed by shop teachers and students from all parts of the State of Indiana were distributed. Although Mr. Weber had asked for only 50 of these prizes, the co-operative shop teachers of Indiana contributed three times that number so that there was a prize for practically one out of every three who attended the banquet.

At the Saturday morning Epsilon Pi Tau banquet, George Surber, President, Mu Chapter, Epsilon Pi Tau, Terre Haute, was chairman. He introduced Merit L. Laubach, Head, Industrial Education Department, State Teachers College, Terre Haute, Ind., as toastmaster.

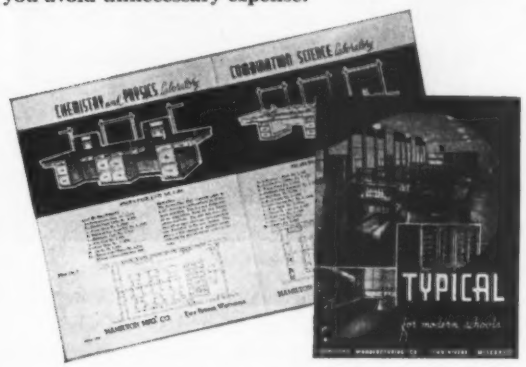
Dr. William E. Warner, Department of Education, Ohio State University, Columbus, Ohio, in his address outlined the changes which have become necessary to make the work started in the manual-training era of the seventies and eighties fit present conditions. He emphasized that

(Continued on page 25A)

How The Hamilton Planning Service Helps You



Before you build or buy, consult Hamilton planning service engineers. Their many years of experience in solving school layout problems will enable them to suggest ideas and make recommendations that will help you avoid unnecessary expense.



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(Continued from page 22A)

the scope of industrial arts is as broad as education itself.

After the breakfast, there were sectional meetings on woodworking, general shop, rural shop, machine shop, mechanical drawing, electricity, printing, related subjects, and the distributive occupations. The co-ordinators also met to discuss their problems. At the business meeting, E. T. Organ Hillyard, Indiana, was elected president for the coming year. Marvel Moore, Richmond, vice-president, and H. G. McComb, West Lafayette, secretary and treasurer.

The place for the 1940 convention will be decided upon later.

At 11:15 a.m., Dr. William E. Warner gave a 15-minute broadcast over Station WSBT-WFAM.

At the Ship's luncheon, held Saturday at 12:15, Dr. Verne C. Fryklund, Professor of Industrial Education, Wayne University, Detroit, discussed organization and good teaching. He called attention to the fact that system and organization are as necessary in education as they are in business and industry; that the manipulative and informational part of our work must be broken down into essential elementary parts before they can be efficiently used; that just as vocational educators need trade analysis so the industrial-arts teacher must prepare an activity analysis if he is to do the best work.

The good teacher, Dr. Fryklund said, must know more than merely a subject. He must also know the children and the youth whom he is to teach. He must be able to project himself into student situations and must consider the feelings and the individual differences which exist in the students before him. At this meeting, Dr. Homer J. Smith in a very striking way, described in a parable form the old-time shop teacher who lacked inspiration, interest in boys, and who taught without an outline of instruction. He also portrayed the good craftsman who became a shop teacher but thought courses in education were not necessary for him, and then described the girl teacher who without more ado, was placed in care of the vocational-guidance department and who fortunately for her students married before she did serious damage to the students whom she was trying to guide.

At the end of the serious part of this meeting, the officers of the Ship distributed the prizes donated by the commercial exhibitors.

♦ The annual meeting of the Georgia Industrial Arts Association was held in conjunction with the annual meeting of the Georgia Educational Association, March 23–25, 1939. At the industrial-arts luncheon meeting at which President Harold J. Sack, presided, E. G. Livingston, chairman of the Fine and Practical Arts Division, South Georgia Teachers College, Collegeboro, gave the main address on *Some Bases for a Program of Industrial-Arts Education.*

Among the guests were: Mrs. Frank David, member of the state board of education; M. D. Mobley, State Director of Vocational Education; J. F. Cannon, State Supervisor of Trades and Industries; Perry E. Babcock, Assistant State Supervisor of Trades and Industries; J. W. McCreery, president of the Georgia Vocational Association.

The officers for next year are: Harold J. Sack, Savannah, president, and John Lytjen, Savannah, secretary. The following were elected to the board of directors: Eli White, Atlanta; Jim Caldwell, Columbus; E. G. Livingston, Collegeboro. — *Harold J. Sack.*

♦ The spring meeting of the Mechanical Drawing Association of New England will be held at Brown University, Providence, R. I., on Saturday, April 22. Carl L. Swan, Newton High School, Newton, Mass., is the secretary.

♦ A second Four-State Regional Conference on Problems of the Industrial-Arts Teacher and Supervisor will be held at Kansas State Teachers College, Pittsburg, Kans., on Friday and Saturday, October 6–7, 1939. There will be five sessions. The topics selected, and the chairmen of the committees are as follows:

1. *Administrative Problems of the Supervisor of Industrial Arts.* Chairman, R. B. McHenry, director industrial education, City Schools, Fort Smith, Ark.

2. *Development of Democratic Ideals Through Industrial-Arts Experiences.* A panel symposium, conducted by Dr. William T. Bawden, head of Department of Industrial and Vocational Education, Kansas State Teachers College.

3. *Problems of Federally Aided and Sponsored Industrial Education.* Chairman, James C. Woodin, director industrial education, City Schools, Wichita, Kans.

4. *Significance of the Concept of Integration in the Industrial-Arts Program.* Chairman, O. B. Badger, director industrial education, City Schools, Tulsa, Okla.

5. *Effective Methods of Organizing Instruction Materials in Industrial Arts.* Chairman, Dr. Hoyt H. London, Department of Industrial Education, University of Missouri, Columbia, Mo.

♦ The 45th annual convention of the Western Arts Association will be held May 3–6, 1939, at the Pantlind Hotel, Grand Rapids, Mich. Harry E. Wood, 5215 College Avenue, Indianapolis, Ind., is the secretary.

♦ The Lansing, Mich., Manual Arts Club was organized in October, 1927. From the beginning, it was recognized that the social side of the teachers needed equal attention along with their professional development. Largely because of this farsighted viewpoint, the Club has developed and prospered in a way that might be the envy of any similar group or organization in the state. Monthly meetings, during the school term, have been held with business and social programs alternating. Social meetings have ranged from hunting, bowling, billiards, shows, and family picnics. Business meetings have included visits to the University of Michigan shops, factory trips, speakers, department talks, and visits to industries in near-by towns.

♦ The first of the National Graphic Arts Conventions to be held in New York City, during

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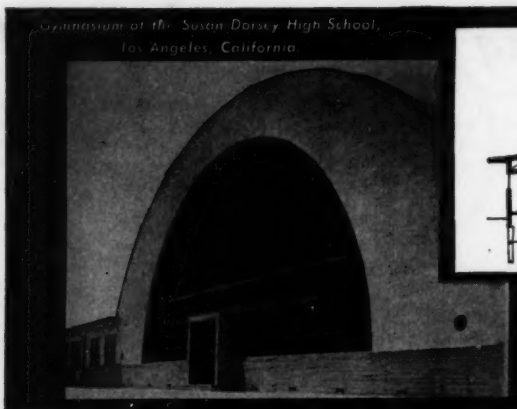

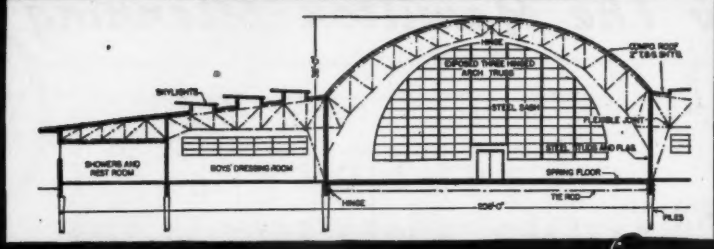

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In addition to the waterproof and soluble blacks, Higgins American Drawing Inks come in 17 lucid waterproof colors, white and neutral tint. Specify Higgins on your next order—and ask your dealer for one of the new Higgins Color Wheels showing Higgins Inks actually applied on drawing paper. Send to us, today, for your free copy of the new and interesting edition of Higgins Techniques.

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(Continued from page 25A)

the World's Fair period, will be the 18th Annual Conference on Printing Education on June 24–29, 1939. The Conference, sponsored by the National Graphic Arts Education Guild, will be held at Columbia University. Visits to the World's Fair will be dovetailed with the Conference program. The New York World's Fair Committee has designated one day at the Fair as Graphic Arts Education Day.

The local arrangements are in charge of the New York Printing Teachers Guild, of which George H. Bennett, of the New York School of Printing is the President.—*Fred J. Hartman.*

♦ The Massachusetts Industrial Education Society monthly meeting for March was held on March 11, 1939. Mr. Richard Lambert, Secretary of the Worcester Employers Association and Director of Apprentice Training, Norton Company, Worcester, was the guest speaker. The title of his address was *What the Industrial Arts Teacher Can Do to Better Prepare Pupils for Industry.*

♦ The third annual conference of teachers of industrial arts in south-eastern Ohio was held on the campus of Ohio University, Athens, Ohio, on Saturday, February 18, 1939. This conference is sponsored by the Department of Industrial Arts at Ohio University under the leadership of the chairman, Professor Charles R. Kinison, who presided at the conference sessions.

At the morning session, Earl M. Wood of the Parkersburg, W. Va., High School discussed the *Status of Related Information in the General Shop Programs of the High Schools of Southeastern Ohio,* and James F. Rittgers of the Logan Senior High School discussed the desirability of using shop-dried lumber for industrial-arts projects. A demonstration of methods of presenting related information to industrial-arts classes was presented by James O. Stephan, instructor in the Department of Industrial Arts at Ohio University. He was assisted by Miss Ashby Coffman, Albert Miller, and Harold Keller who are students in the Department.

At the noon-luncheon session, F. Theodore Paige, Instructor in the Department of Industrial Arts at Ohio University, acted as toast-Dean of the College of Applied Science as the principal speaker of the meeting.—*Chas. R. Kinison.*

♦ The Fifth Annual Convention of the New England Industrial Arts Teachers Association will be held at Portland, Me., on November 3 and 4.

♦ The annual conference of the Southern West Virginia Industrial Arts Association will be held at New River State College, Montgomery, W. Va., on Saturday, April 29, 1939. Mr. William Childs, Instructor of Industrial Arts at Central Junior High School of Huntington, W. Va., is chairman. Mr. Frank C. Moore, Director of Industrial Arts, Cleveland, Ohio, will be the main speaker. A display of commercial exhibitors has been planned under the direction of Professor Glenn E. Best, New River State College, Montgomery, W. Va.

♦ The February meeting of the School Crafts Club was held on February 18 at the West Side Y.M.C.A. Bldg., New York City.

Following the business meeting, Professor Wayne P. Hughes, Eastern Illinois State Teachers College, Charleston, Ill., and who at present is doing work at the Center for Safety Education, New York University, spoke on "Safety in Industrial Arts Education."

♦ More than forty industrial arts and vocational instructors, representing several cities in the western part of Illinois, attended the third quarterly Industrial Arts Round Table banquet held on Wednesday, March 15, in East Moline, Ill.

Business was conducted by the president, J. S. DuCrey of Moline. Reports of various committees were given, and plans were made for the annual convention of the Illinois Vocational Association which will be held in Moline on April 13–15, with headquarters at the LeClaire Hotel.

L. L. Josserand of East Moline acted as program chairman for the evening. The main address was given by Charles Raisbeck, Assistant Superintendent of Production at the John Deere Spreader Works plant in East Moline, who talked on *Vocational Guidance in an Industrial Community.*

The last meeting of this year will be held in May at Rock Island.—*L. L. Josserand.*

♦ The Metropolitan Industrial Arts Round Table, Division 1, Illinois Industrial Education Association, held its get-together meeting at the Riverside-Brookfield High School, Riverside, Ill., Friday, March 17, 1939.

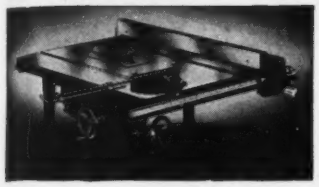
After the dinner, the members in attendance divided into seven groups. The mechanical-drawing group met under the chairmanship of H. D. Campbell to discuss budgets and instrument rentals. The woodworking group, under O. A. Oaks, discussed boats; the auto mechanics, under D. M. Dean, listened to an address on "Suggestions for Improving the Teaching of Auto Mechanics," by John Claude of The Bruce Publishing Company, Milwaukee, Wis. Frank Culhane, assistant supervisor of industrial education for Illinois, and H. R. Ong, Champaign, Ill., spoke on the exhibits of the Illinois Vocational Association convention. W. L. McDougal was chairman of the electrical section at which projects in the school shop and the value of competitive exhibits at conventions were discussed.

A panel discussion under the direction of E. E. Field was held on the topic of "The General Shop, Its Objectives, Advantages, Organization, Methods, and Results." R. H. Chandler was the chairman of the machine-shop section at which equipment, maintenance, and reconditioning were discussed. The building-trades group, under the chairmanship of W. Durbahn, discussed "Apprenticeship in the Building Trades and Safety Program in the Construction Field."

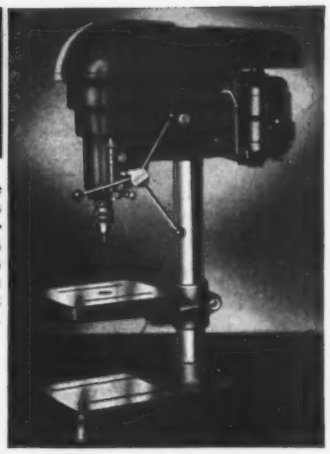
♦ The annual Western Pennsylvania Industrial Arts Conference will be held at State Teachers College, California, Pa., on Saturday, April 22, 1939.

At this conference Dr. William E. Warner will speak on the "Newer Concepts of Industrial Arts," and Dr. Boyd H. Bode will discuss the "Social Implications of Industrial Arts."

BOICE-CRANE *shop-tested* POWER TOOLS *for* Programs-Equipment Abreast of Industrial Trends

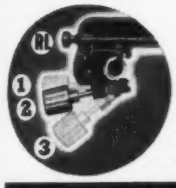


THE FIRST Boice-Crane machines built 28 years ago exploded the belief of industrial woodworkers that only big, expensive machines were efficient enough for commercial work. BOICE-CRANE—pioneer and leader in its field sells industry larger numbers of its machines each year. Now—alert educators are following industry's example, finding too that BOICE-CRANE leads in desirable modern improvements, super-safety, and a never equalled quality that keeps BOICE-CRANE machines running for many *extra* years.



NEW! Tilting-Arbor Saw

Again in 1939 BOICE-CRANE leads in Tilting-Arbor Saws. 9 years ago BOICE-CRANE was the first tool builder to introduce this better kind of saw to the medium price field. Widely imitated since, but the exclusive, fool-proof, BOICE-CRANE Rolling Pulley Drive has never been equalled! All the power you want up to 1½ h. p. at a big savings! Now has a new, finer Rip Fence never offered before in any saw!



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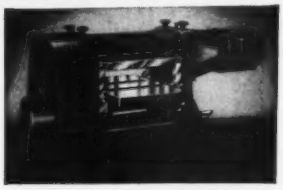
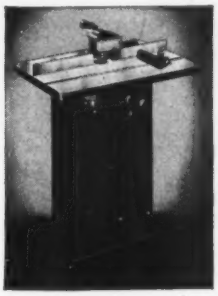


12"x4" THICKNESS PLANER

Large enough to handle ninety-nine of every hundred jobs of planing in school shops. Saves floor space. Priced low for modest shop budgets. Don't be without a planer another term!

Planes hardest cabinet woods so smooth no sanding is necessary! Built like expensive cabinet planers. Belt and direct motor drives, bench or floor types. *Get full details!*



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New HELMET-HEAD Safety Drill Press

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UP-TO-DATE TOOLS FOR TODAY'S INDUSTRIAL TRAINING

New Publications

How to Estimate for the Building Trades

By Townsend, Dalzell, and McKinney. Cloth, 629 pages, 8½ by 6, illustrated. Price, $4.75. Published by The American Technical Society, Chicago, Ill.

The exceedingly important job of estimating for the building trades is well covered in this comprehensive volume.

The mathematics entering into the work of the estimator are briefly explained. Then there are directions for reading blueprints; complete specification cost records and estimating forms; survey-estimating forms and material calculations for the carpenter, mason, plumber, electrician, sheet-metal worker, marble and tile setter, lather and plasterer, and for the painter.

Useful tables of many kinds are found throughout the work.

Pottery

By John Wolfe Dougherty. Cloth, 179 pages, 6 by 9, illustrated. Price, $2.25. Published by The Bruce Publishing Company, Milwaukee, Wis.

This is a book for the beginner and describes the art of pottery in simple terms. It is as useful in the industrial-arts departments of the school as it is in the home workshop.

Besides a short history of pottery, the various techniques such as building with coils, hand building, wheel building, sticking up with slabs, casting, modeling figures, and the like, are all described in step-by-step procedure directions.

The operational steps, besides being described so that the beginner can readily understand them, are clearly and fully illustrated.

A glossary and a list of needed equipment, tools, and supplies are appended.

Vocational Hygiene

By Daniel Caplin and S. G. Ocean. Cloth, 207 pages with 18-page appendix, illustrated. Price, $1.20. Published by the Globe Book Company, New York City.

This book places special emphasis on the proper development of safety habits of the worker. In Part I of the book, hand-tool accidents, machine accidents, shop conditions, health habits, hygienic conditions in school shops and posture in sedentary occupations are discussed.

Part II describes those accidents in which breathing is suspended, poisoning, and objects in the eye, ear, or nose.

Part III is devoted to safety in traffic, the driver's and pedestrian's responsibilities, and the acquisition of proper attitudes.

Part IV describes a safety-education plan for vocational high schools.

The appendix contains a list of the agencies from which literature on vocational hygiene may be obtained, and a descriptive list of the more common poisons.

Aeronautical Occupations

By Burr W. Leyson. Cloth, 207 pages, 5¼ by 8, illustrated. Price, $2. Published by E. P. Dutton and Co., New York City.

This book is written by one who has had over 21 years of experience in aviation. He describes in an interesting manner, all of the major occupations found in this field of transportation, and shows what training is required for each job, how and where it may be obtained, and what opportunities for promotion are offered.

Pottery of the Ancients

By Helen E. Stiles. Cloth, 132 pages, 5¾ by 8⅛, illustrated. Price, $2.50. Published by E. P. Dutton and Co., Inc., New York City.

A book in which the pottery of many peoples is interestingly described and beautifully illustrated.

Model Sail and Power Boats

By Claude William Horst. Cloth, 104 pages, 9 by 12, illustrated. Price, $2. Published by The Bruce Publishing Company, Milwaukee, Wis.

This is a revised edition to which has been added a new chapter on "Fixtures" and a new glossary.

The construction of eleven models is given. All of these models are constructed by the novel method developed by the author which provides ease of shaping, yet gives strength and rigidity.

The entire material has been carefully revised, and the amateur, whether in school shop or in the home workshop, will find the illustrations and descriptions quite easy to follow.

News Notes

♦ The First Annual Exhibition of Textbooks under the sponsorship of the Textbook Clinic of The American Institute of Graphic Arts will be opened to the public on May 23 at the Public Library, New York City, and will continue until June 3. An advance opening for members and exhibitors will be held on the evening of May 22.

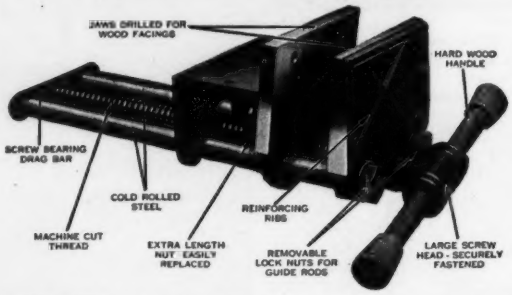
♦ The 1939 National Safety Congress and Exposition — the world's biggest annual safety event — will be held in Atlantic City, N. J., October 16–20, 1939. There will be 130 sessions and 600 speakers at the Congress, touching on every phase of safety — industrial, traffic, home, school, and public.

♦ New York University has acquired the three 6-story buildings of the Hebrew Technical Institute at Stuyvesant Place and East Ninth St., New York City, on a long-term lease for the use of the School of Education in expanding its vocational-education program, it was announced jointly by Dr. K. George Falk, President of the Institute and Chancellor Harry Woodburn Chase. The acquisition will provide the University with 56,000 square feet of additional class- and shop-room space beginning next fall. At the same time, Dr. Falk announced that

(Continued on page 30A)

COLUMBIAN VISES

Woodworkers'


JAWS DRILLED FOR WOOD FACINGS
HARD WOOD HANDLE
SCREW BEARING DRAG BAR
COLD ROLLED STEEL
REINFORCING RIBS
MACHINE CUT THREAD
EXTRA LENGTH NUT EASILY REPLACED
REMOVABLE LOCK NUTS FOR GUIDE RODS
LARGE SCREW HEAD - SECURELY FASTENED

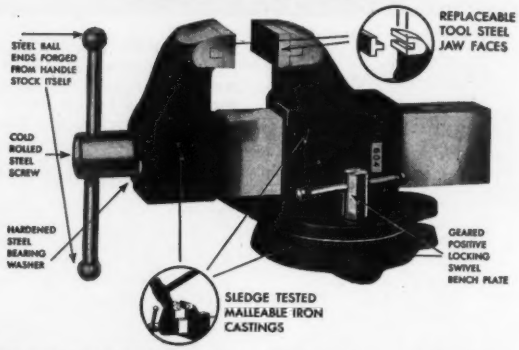
COLUMBIAN Rapid Acting Woodworkers' Vises are designed for school and industrial shops where time is an important factor. Especially adaptable where large changes in jaw opening must be made frequently.

Simple rapid acting mechanism consists of a bronze half-nut operating in the groove produced by milling off a section of each thread for the length of the screw. A slight turn of the handle engages the threads of the nut and screw, and a half turn tightens the vise on the work.

Columbian Continuous Screw Woodworkers Vises are simple in design, rugged in construction and practically "fool-proof." They can be furnished with either wood or steel handles.

The Columbian Line also includes Combination Pipe Vises, Hinged Pipe Vises, Garage Vises, Bench Anvils, and "C" Clamps. Write us for complete catalog and name of the Hardware or Industrial distributor carrying Columbian Vises in stock.

Machinists'


REPLACEABLE TOOL STEEL JAW FACES
STEEL BALL ENDS FORGED FROM HANDLE STOCK ITSELF
COLD ROLLED STEEL SCREW
HARDENED STEEL BEARING WASHER
GEARED POSITIVE LOCKING SWIVEL BENCH PLATE
SLEDGE TESTED MALLEABLE IRON CASTINGS

COLUMBIAN Malleable Iron Machinists' Vises are designed to give the service required of quality tools. Guaranteed not to chip, crack, or break.

JAW FACES of hardened tool steel, pinned securely so that they will not come loose in use, can be replaced.

STEEL SCREW and MALLEABLE IRON NUT are designed to give maximum strength. A hardened steel thrust washer under the screw head prevents wear and eliminates end play. STEEL BALL ENDS on the handle are forged from the handle stock itself, and will not come loose.

SWIVEL BASE VISES are locked in any position by a forged steel lock bolt, and steel clamping nut.

BASES on all Columbian Machinists' Vises are machined flat to permit solid mounting and eliminate cutting bench tops.

THE COLUMBIAN VISE & MFG. CO.
9017 Bessemer Ave. CLEVELAND, OHIO

(Continued from page 29A)

the Institute, which has been in operation for fifty-five years, would close in June. One of the first schools in the country to offer workshop and laboratory courses, combined with academic subjects to boys from fourteen to seventeen years old, the Institute has graduated nearly 4,000 students since its establishment in 1884. Dr. Chase said the University will place at the disposal of the Directors of the Institute five full-tuition scholarships for the new program to be conducted there this year, the number to be increased annually until twenty such scholarships will be in force annually during the duration of the lease.

♦ A copperweld mill, the State of Pennsylvania and the local school are co-operating in sponsoring free vocational classes in Glassport, Pa., for millworkers.

Shop drawing, blueprint reading, shop math, metallurgy, and accounting are being taught one evening a week in the high school to approximately 125 industrial workers, the majority under 25 years of age.

Textbooks and one third of the instruction cost are paid for by the Copperweld Steel Co., and the state pays the additional instruction cost from a special vocational-education fund. The local school board furnishes the facilities and classroom space of its high school.

The majority of students are from Glassport's three industrial plants: A foundry, a glass factory, and the copper-wire mill, although any district millworker or furloughed employee is eligible to register for the courses. The project was conceived and worked out by C. W. Holmquist, superintendent of the copperweld plant, and Glassport's supervising principal, Melvin J. Naser.

♦ In an effort to stimulate interest in forestry among school children, the Greensboro, N. Car., board of education, with the assistance of the North Carolina Forestry Division, is starting a school forest on lands adjacent to one of the Greensboro public schools. 10,000 short-leaf pine seedlings from the state forest nursery have already been planted on a 30-acre tract adjacent to one of the city schools, and plans call for the eventual planting of 100,000 trees on some 200 acres of available land adjacent to the several city public schools.

♦ The new South Vocational High School, Pittsburgh, Pa., which is being built for completion by the 1940 fall term, will have a woodshop, two machine shops, automobile laboratory, welding shop, two electric shops, and a demonstration room. Thirteen trades will be taught.

The proposed new school, to cost $741,893, will be built similar to a modern factory, with considerable glass window space.

An old elementary school is being remodeled for a girls' vocational school scheduled to open at the same time as the boys' building. The girls will be taught beauty culture, cafeteria service, cooking, dressmaking, home service, millinery, sewing, and tearoom work.

According to the Pittsburgh school board, the vocational students will spend 50 per cent of the time doing practical work in the shops, 25 per cent doing academic work, and 25 per cent in related activities.

♦ Work has been started on the foundation of a $1,200,000 vocational boys' high school at McKeesport, Pa. The school is expected to be ready for occupancy by the 1940–41 term.

♦ The seventh annual summer training courses for teachers of automotive mechanics in high schools and colleges will be offered at General Motors Institute at Flint, Mich. The course is open to qualified teachers and those in allied professions who are designated by school authorities or representatives of General Motors as being eligible for such training.

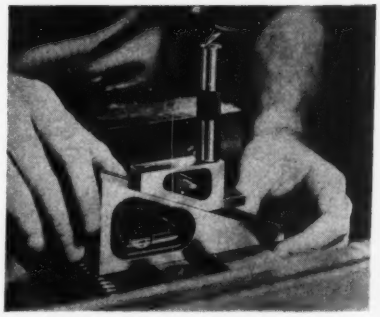
Teachers will have a choice of two sessions. The first will open on June 26 and extend through July 21. The second session will begin on July 24 and continue through August 18.

The course of instruction covers automotive specifications and adjustments, vocational-guidance information, service methods and procedure, and actual shop training. Charts, manuals, and film slides of automotive manufacturers will be available for training courses, supplemented by visits to automobile plants, the General Motors research laboratories and the proving ground.

Applications for enrollment should be addressed to the registrar of the Institute.

New Products

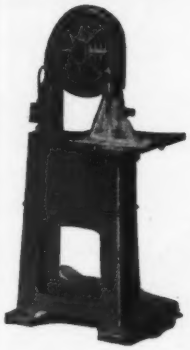
THE L. S. STARRETT CO., ATHOL, MASS., are marketing an improved planer and shaper gauge which holds the alignment and parallelism of ends, sides, and work contacts to much closer limits, and in which the lateral play of the slide and base is eliminated through the use of angular ways. When this gauge is set to a micrometer,



surface gauge or caliper, and the planer or shaper tool brought into contact with it, the cut may be absolutely relied upon. The range of this gauge, with the 3-in. extension used on the longer measurements, is ¼ to 9 in. The level

(Continued on page 32A)

WALLACE NO. 16 BANDSAW



Specifications

Diameter of wheels	16″
Capacity under guide	8″
Standard wheel speed, r.p.m.	1100
Standard blade speed, ft. per min.	4600
Table size	20″x20″
Motor h.p. single phase a.c.,	½ and 1
Motor h.p. three phase a.c.,	1 and 2
Net weight, lbs.	333

Here is a gear-driven bandsaw, with the wheel speed pitched at 1100 r.p.m. to provide 4600 feet of blade per minute!

The Wallace No. 16 Bandsaw puts a new pleasure in bandsawing work, operating smoothly and quietly on the heaviest cuts. Its high speed makes for performance never before experienced in a portable unit,—dynamic balancing completely eliminates vibration and makes this machine exceptionally "easy" on blades.

Give your students the advantage of working on actual production machines. Write today for our latest bulletins and quotations on the units you need,—no obligation, of course.

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PRECISION LATHES

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See the SHELDON before you buy.

For schools the Type U Sheldon Lathe (illustrated) is ideal. Full Bowl Headstock and Cabinet Leg enclose all gears, cones and belts. 4-speed roller bearing V-belt Drive has 2 Outside Shift Levers that permit students to change speeds without touching belt or pulleys. Full Quick Change Gear Box (4 to 224 threads per inch). Longitudinal Worm Feed with Power Cross Feed.
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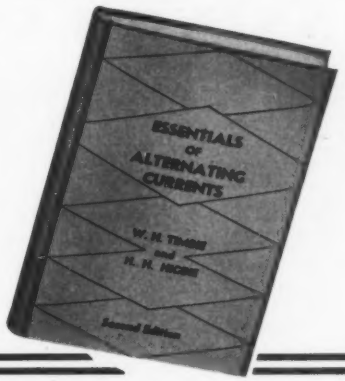

ESSENTIALS OF ALTERNATING CURRENTS

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•

Timbie books are known wherever electricity is taught....

•

Second Edition (March 1939)

This book has been entirely rewritten in the second edition, and all obsolete material removed. New devices and methods of using them have been introduced, especially in the chapter on converters and rectifiers, where much of the latter material concerns new developments for both power and communication purposes. New applications of devices already known have been included, such as the use of static condensers for power-factor correction. Current practice is now represented, as in the treatment of synchronous motors, the single-phase motor, and starting and control apparatus for alternating-current motors. The second chapter has been rearranged to provide a more logical approach to an understanding of the basic ideas. The general style of the book is unchanged; however, the illustrations, numerical examples and problems are keyed to modern living. Each chapter concludes with a summary of the topics discussed therein.

377 pages 249 illustrations 5 x 7 $2.25

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"OLIVER" *METAL* SPINNING LATHE

In the nation's leading schools, instructors are teaching their students to spin beautiful cups, vases, etc. from disks of bronze, aluminum, copper, Britannia metal, etc. These instructors agree with Mr. H. M. Dexter, authority on metal spinning, that the features of the "Oliver" Metal Spinning Lathe have been engineered into one unit to deliver smoothness and accuracy as they had never experienced before. This Lathe is also fine for turning metal and wood.

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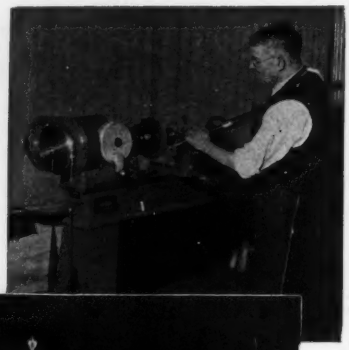

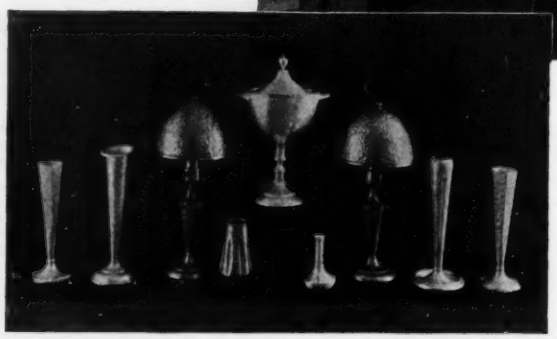

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SANDING IS FUN!

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SKILSAW BELT SANDER

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Actually 3 tools in 1! Use it as portable sander, edge sander or spindle sander. Also for resurfacing blackboards, desks, wood trim and stair treads. *Thousands in use!*

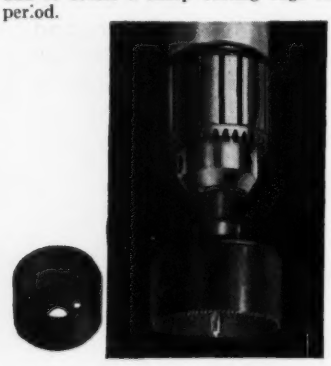
SKILSAW, Inc.

5035E ELSTON AVENUE, CHICAGO

(Continued from page 30A)

built into the base of the gauge is extremely useful when setting up work on the planer table. Both base and slide are hardened steel forgings with all working surfaces accurately ground. Base dimensions are: ¾ inch wide, 5¼ inches long. The extension is ⅝-inch diameter, 3 inches long. The total weight of the gauge is approximately 25 ounces.

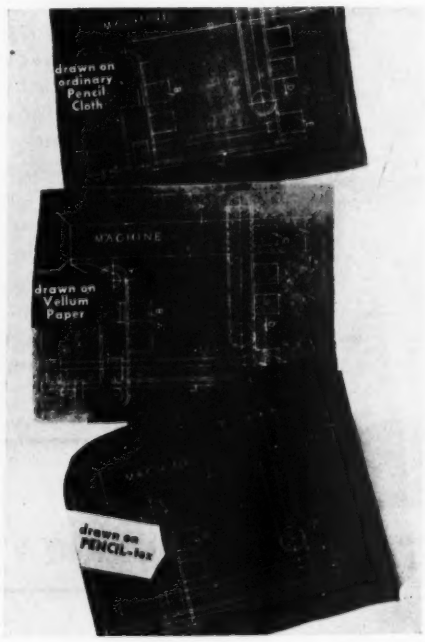
SKILSAW, INC., Chicago, Ill., manufacturers of portable electric tools, have just marketed a new line of hole saws which, it is claimed, offer many advantages over other saws of this type. Skilsaw hole saws are made in one piece of 18-per-cent tungsten high-speed steel, developed to cut faster and to retain a sharp cutting edge for a longer period.



Skilsaw hole saws come in a wide variety of diameters from ¾ in. to 3½ in. They are used with electric drills of ½-in. capacity or larger for cutting clean holes in sheet metals, pipes, cast iron, wood, tile, plaster, marble, Bakelite, and other composition materials.

THE FREDERICK POST COMPANY recently introduced a pencil drafting cloth under the name Pencil-tex.

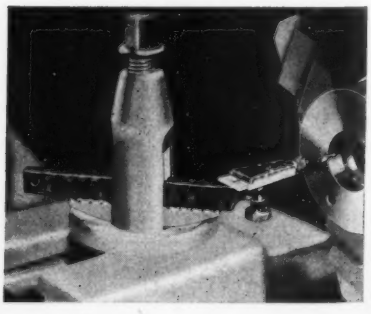
Of similar appearance to fine tracing cloth, Pencil-tex has a new and patented velvety surface with a remarkable affinity for pencils of all degrees of hardness. Post claims that even the hardest of hard pencils will leave a sharp, uniform, ink-dense line in its wake. This line intensification, together with a glasslike transparency, permits the production of a blueprint with the sharp contrast of prints made from fine ink tracings. Prints made through Pencil-tex are completely without the characteristic fuzzy line and foggy unworkmanlike appearance of blueprints made from ordinary pencil drawings.



The accompanying unretouched photo illustrates identical drawings made with a 5H pencil on ordinary pencil cloth, on vellum paper, and on Pencil-tex. It will be observed that the lowest blueprint made from Pencil-tex lacks all fog and fuzziness of the characteristic "made-from pencil drawing" blueprints and has the sharp contrast and professional appearance of prints made from excellent inked tracings.

A novel *try-it-yourself kit* is now being distributed to interested drafting supply users through the local Post dealers or the manufacturer who may be addressed at P.O. Box 803, Chicago, Ill.

THE STARRETT UNIVERSAL JUNIOR INDICATOR is an unusually sensitive and flexible instrument marketed by the L. S. Starrett Co., Athol, Mass. It has a wide range of applications.



The ball contact point is held by a friction joint which permits it to be moved to any angle. This friction joint is mounted at the end of a rotating friction sleeve which can be turned completely around. In addition, the indicator it-

(Continued on page 37A)

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(Continued from page 32A)

self can be mounted on the top or the side of the shank. This range of adjustment makes it possible to mount the indicator for any operation so that the graduated scale is always in the most convenient position for easy reading, without physical strain or eyestrain and without the use of double scales or mirrors. In addition, this tool is furnished with a brass collar which serves as a clamp for attaching the indicator to the jaw of a height gauge.

The Universal Junior has a range of .012 by thousandths. Casehardened steel and die-cast parts are used throughout.

New Trade Catalogs

A NEW 40-PAGE, 8½ BY 11-IN. BOOK recently issued by the South Bend Lathe Works, South Bend, Ind., describes the practical servicing equipment for the popular-sized automotive-repair shops, and the types of work most profitable to perform with it.

Write the Technical Service Department, South Bend Lathe Works, South Bend, Ind., for your free copy, mentioning this magazine.

BALKO ELECTRIC TOOL AND SUPPLY CO., 605 Washington Blvd., Chicago, Ill., have just issued their catalog No. 9. In it are listed spray-painting equipment, router and carving motor tool outfits, flea-power motors, small power metalworking lathes and accessories, small power woodworking machinery, V belting, hand tools for wood and metalworkers, reducing gears, bearings, pulleys, and grinding wheels.

Trade News

THE DELTA MFG. CO., 600 E. Vienna Ave., Milwaukee, Wis., is featuring a contest in order to arrive at authoritative information on how best to arrange the low-cost, light power tools which are becoming increasingly more popular in the woodworking shops and general shops of our schools.

This firm has pioneered the development of low-cost power tools, and they are also pioneering in obtaining answers to the questions: What are the best arrangements of these low-cost units for woodworking shops and for general shops? How can these tools be used to best advantage? How can the most be made of special features of these machines? What changes, if any, in instruction procedure are made necessary when light power tools are acquired for the school shop?

The information thus gathered will be widely disseminated so that other industrial-arts teachers may profit by what their fellow workers have already discovered.

For information on this contest, write to the Contest Editor of the Delta Mfg. Company.

THE PORTER-CABLE MACHINE COMPANY, Syracuse, N. Y., announce the following changes in their sales organization: In Cleveland, Clif Stewart and Homer S. Tripp succeed George Strauss, transferred to San Francisco, as agency managers for Porter-Cable Machine Company, handling the full line of floor sanders as well as saws and machine sanders. In Boston, W. H. Johnson succeeds George H. Mollahan who resigned. In Louisville, Ky., S. S. Waters, with offices at 1014 W. Main St., succeeds H. M. Bailey as agency manager, handling the entire line.

A SPECIAL PRICE ON CATALIN is now being offered by the Universal School of Handicraft Supply Service, 1270 Sixth Ave., New York City. A bulletin will be sent on request to purchasing agents concerning these special offers. Project sheets and other helpful material for instructors are available.

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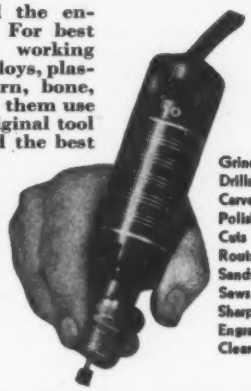

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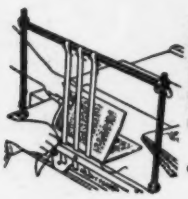

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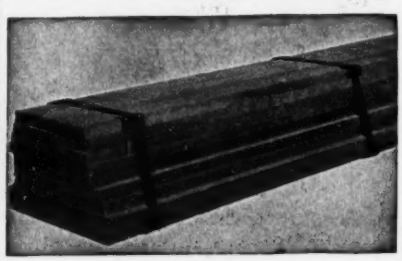

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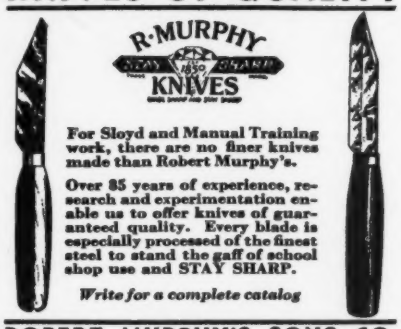

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